THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXXII.—No. 10. Whole No. 1,291. | NEW YORK, MONDAY, MARCH 5, 1900. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager. THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

LIBRARY OF CONGRESS MAR 5 1900 SMITHSONIAN DEPOSIT

Published on each Monday of the year, at No. 32 Pine Street, New York.

Collections are invariably made directly from this office for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $5 (£1—25 francs). All payments to be made in advance. Single copies, 10 cents.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

Remittances should be made either by post office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

The **American News Company,** Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

Books.—We will forward by express, at publisher's lowest rates, any book—scientific or otherwise—to any address in the United States or Canada. We would suggest to our patrons that to avoid the risk and expense consequent on sending us the money (we do not send books C. O. D.), that orders for books be sent us through the Purchasing Department of the American Express Company.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICES—
Sixteenth Annual Meeting, Ohio Gas Light Association..... 361
Wrinkle Department, Western Gas Association..... 361

EDITORIALS—
Briefly Told..... 362
The Address of President Addicks—How to Secure a Copy of the Proceedings of the International Gas Congress—Notes.
Proceedings, Thirtieth Annual Meeting of the New England Association of Gas Engineers—Official Report—Revised by the Secretary..... 362
First Day, Morning Session—Report of the Board of Directors—Election of New Members—Nominating Committee—Welcoming the Visitors—Report of the Treasurer—Telegram to the Michigan Gas Association—Letters of Regret—*Address of President Addicks—Committee on President's Address—Roll Call—Appointment of Committees, Obituary Resolutions—Pumping Gas Five Miles at Twenty Pounds Pressure, by Mr. F. H. Shelton, Phila., Pa.—Discussion.
The Value of Producer Gas as a Fuel..... 370
ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 372
Contracts for the Logan Iron Works—The Proposed Works for Great Falls, Mont.—Death of Mr. A. C. McGarth—The Consumers Gas Company, Northampton County, Pa.—Mr. J. W. R. Cline to Take Charge at Newport and Covington Ky.—Hints from Spokane Falls, Wash.—Annual Meeting, West Chester, Pa.—Lease of the Frederick (Md.) Works—Cheaper Gas for Winnipeg, Manitoba—The Proposed Works for Sault Ste. Marie, Mich.—Mr. Edward C. Lee Resigns—Death of Mr. Thomas Wood—A Hint from Newburg, N. Y.—Mr. W. C. Reed Takes Charge at Anniston, Ala.—Mr. Morris Secures the Seneca Falls and Waterloo (N.Y.) Plant—The Conneaut (Ohio) Company—A Circular from the Cincinnati Company—And Other Items.
The Market for Gas Securities..... 374

[OFFICIAL NOTICE.]

Sixteenth Annual Meeting, Ohio Gas Light Association.

OFFICE OF THE SECRETARY,
DELAWARE, OHIO, Feb. 15, 1900.

The sixteenth annual meeting of the Ohio Gas Light Association will be held at Columbus, Ohio, March 21st and 22d, 1900.

The President, Mr. A. P. Lathrop, of St. Paul, Minn., will call the meeting to order, on Wednesday, March 21st, at 9:30 A.M., in convention hall at the Chittenden Hotel, the headquarters. An address of welcome will be delivered by the Hon. George K. Nash, Governor of Ohio. A response will be made by ex-Governor Asa S. Bushnell, President Springfield Gas Company.

The following papers will be presented:

"By-Product Coke Ovens as a Source of Gas Supply," by Mr. Peter Young, Gas Engineer, Detroit, Mich.

"Street Lighting," by General Andrew Hickenlooper, President Cincinnati (Ohio) Gas Light and Coke Company.

"Prepayment Meters," by Mr. John D. McIlhenny, President Citizens Gas Company, Terre Haute, Ind.

"The Present Status of Fuel Gas," by Mr. John R. Lynn, Supt. Portsmouth (Ohio) Gas Company.

"Gas Appliance Exchanges," by Mr. Fred. R. Persons, Manager Toledo (Ohio) Gas Appliance Exchange.

"Some New Ideas about Oxide Purification," by Mr. B. E. Chollar, Engineer Laclede Gas Company, St. Louis, Mo.

The Question Box, which is always an interesting feature, will be given special consideration. Each member is requested to make contributions for it, and send them to the Secretary not later than March 7th, so that they may be printed.

The gas works, the electric light plant, with a new 685-horse power gas engine, the pipe works and other places of interest will be open to the inspection of the members.

The ladies will be cordially welcomed and cared for.

An opportunity will be given any of the speakers at the meeting to correct their remarks before leaving Columbus, but not after, as all the reports will be turned over to the printers immediately after the adjournment of the meeting.

The Chittenden is conducted on the American plan, and the following rates have been secured for the meeting: $2.50, $3 and $3.50 per day for rooms without bath; $3.50 and $4 per day for rooms with bath. The Chittenden hopes to entertain all of the Association, and will put forth every effort to make the members comfortable. The most satisfactory quarters are always obtained by writing in advance to the hotel people.

The Secretary will furnish with pleasure application blanks for membership, and any further information which may be desired relative to the meeting.

T. C. JONES, Secretary.

[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

WRINKLE DEPARTMENT WESTERN GAS ASSOCIATION,
OFFICE OF THE EDITOR,
112 NORTH BROAD ST., PHILA., PA., Feb. 16, 1900.

To the Members of the Western Gas Association: The Western Gas Association elected me last year Editor of its Wrinkle Department. The duty of the Editor is the securing (for presentation in convenient form to the Association, at its annual meeting), all possible wrinkles, ideas, devices, suggestions, etc., that during the year have been found by the members to be clever and helpful, in either the construction or operation of a gas works or company.

The success of the Wrinkle Department has been marked. It is looked forward to yearly with interest. *Its success, however, is de-*

pendent on the co operation of the members. Will you not kindly help the success of this feature at this year's meeting by sending me shortly a brief description of any thing or idea that you may have recently noticed, or that occurs to you as suitable for a "wrinkle?" Whether this be something noted by either yourself or your assistants or helpers, in your own works or in those of another, is not material. It is the point itself that is desired, and that each member is asked to kindly contribute, whenever possible.

Drawings necessary to illustrate an idea need not be exact or carefully made, a simple rough sketch will be sufficient, and will be redrawn here if desirable. Your active co-operation in the above will be appreciated by the Association at large, and by the Wrinkle Editor in particular.

Very truly yours,
F. H. SHELTON, Editor.

BRIEFLY TOLD.

THE ADDRESS OF PRESIDENT ADDICKS.—The thirtieth meeting of the New England Association of Gas Engineers, as was quite clearly defined in the JOURNAL'S preliminary mention thereof last week, was an excellent one. The delegates were intent on their work, the matter offered preliminary to discussing matters of practical worth to the industry was of the fruitful sort, and the general interest in the sessions, from their starting to their finishing, was unabated. Not the least thought-provoking measure of the sessions, as may easily be taken for granted, was the annual address of the President, Mr. Walter R. Addicks, whose position as Chief Engineer of the Boston, Bay State and Brookline Gas Companies, naturally puts him prominently before the eyes of the Eastern gas fraternity. Of a personality that is attaching, but in a service that is harassing, he had a difficult task to complete; for, no matter how much one may personally like another, the one's opinion respecting the conduct of business affairs in which each is interested is very much outside the personal conclusion. A reading of the message (which is given in full in our current installment of the proceedings of the meeting) will show that Mr. Addicks has not lost his faith in the supplying of gas, as that supply has been ordinarily conducted of recent years; and even though he "mused" a trifle over what might be done in the instance of a "combination" lighting-producing, coke-evolving plant, the underlying tenor of the whole speech is that gas works, as ordinarily constructed and operated, are pretty good properties to manage. It was thought that he would have said something about the prevailing epidemic respecting appeals from the residents of the East—and especially in Massachusetts—for cheaper gas rates; but he did not, save by way of inference. However, the lines that lead to such inferring are sufficiently pointed to attract the attention of those who read the message carefully. They will be found in the second paragraph, and plainly tell the truth. The prices of everything that enters into the manufacture and distribution of gas have increased and are increasing, but the householder, who without a murmur admits that he now pays more for his beef, his flour, or whatever else he uses to keep up his life, declares that gas must be cheapened. The moral of it all is that bedrock in gas rates seems to have been reached for the time being, and that the legislative agitators and blackmailers who thrived in one way or another in their attacks on gas companies should be plainly shown that their blackmailing days in this instance are at an end. The address covers a wide range of subjects, and it goes without saying that it can be studied with profit.

HOW TO SECURE A COPY OF THE PROCEEDINGS OF THE INTERNATIONAL GAS CONGRESS.—Last week (p. 333) we printed the text of a circular, issued by the officers of the American Gas Light Association, respecting certain details connected with the proposed international Congress of the gas industry at the forthcoming Paris Exposition. The circular explains itself completely, but in connection therewith we should have added that the members of the American Gas Light Association who desire to secure a copy of the proceedings of the Congress, but who do not expect to be able to be present at the meetings, may remit to Secretary Forstall the equivalent of 20 francs ($3.95, which includes the cost of exchange), who will remit the amount received in bulk to the Treasurer of the Congress, and further see to it that the members sending the money will receive the proceedings when published.

NOTES.—Mr. Neal B. Mallon, having disposed of his interest in the Newark (Ohio) Gas Light and Coke Company, will retire from his position as manager thereof on the 20th inst.——The Redlands (Cal.) Gas Company has been incorporated by Messrs. H. Fisher, H. H. Sinclair, G. B. Ellis, F. P. Morrison and H. M. Allen. It is capitalized in $100,000.——The Board of Directors of the Washington (D. C.) Gas Light Company have perfected the following organization: President, John R. McLean; Secretary, William B. Orme; Treasurer, John C. Poor; Asst. Secretary, S. N. Whitwell.——The proprietors of the Jenkintown and Cheltenham (Pa.) Gas Company have put the net selling rate on illuminating account at $1.65 per 1,000 cubic feet, a concession of 10 cents.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.]

PROCEEDINGS, THIRTIETH ANNUAL MEETING OF THE NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD AT YOUNG'S HOTEL, BOSTON, MASS., FEB. 21 AND 22, 1900.

FIRST DAY, FEB. 21—MORNING SESSION.

The President (Mr. Walter R. Addicks, Boston) called the meeting to order at 10 A.M. The Secretary (Mr. N. W. Gifford, New Bedford, Mass.) occupied the recorder's chair. The reading of the minutes of the last meeting having been dispensed with, the President called for

REPORT OF THE BOARD OF DIRECTORS,

which was read by the Secretary:

To the Members of the New England Association of Gas Engineers: Your Directors, at a meeting held February 20th, 1900, voted to recommend for election to membership in this Association the following gentlemen:

Active.—Louis J. Hirt, Chief Engineer, Mass. Pipe Line Gas Company, Everett, Mass.; John D. Milne, Supt. gas division, Connecticut Lighting and Power Company, Norwalk, Conn.; F. M. Travis, Supt. gas division, Torrington (Conn.) Electric Light Co.; C. E. White, Treas. Wakefield (Mass.) Municipal Light Plant.

Associate.—H. N. Cheney, Bay State Gas Co., Allston, Mass.; Albert Dunbar, Supt. Distribution, Brookline (Mass.) Gas Co.; John T. Fiske, Concord, N. H.; F. A. Langforth, Director New Haven (Conn.) Novelty Machine Co.; G. F. Macmun, Jr., Marlboro (Mass.) Gas Light Co.; H. E. Thompson, New Haven (Conn.) Novelty Machine Co.; F. Tudor, Jr., Treas. Massachusetts Pipe Line Co., Boston, Mass.; W. L. Walker, Fitchburg, Mass.

Transfer from Associate to Active.—T. H. Sargent, Supt. Lawrence (Mass.) Gas Co.

ELECTION OF NEW MEMBERS.

On motion of Mr. Harbison, the report was accepted. On motion of Mr. Prichard, the Secretary was instructed to cast the ballot of the Association in favor of the election to membership of the gentlemen named. The Secretary reported that he had carried out the instruction, whereupon the President declared the election, and invited the new members to actively participate in the meeting. The resignations of Mr. E. B. Lewis and Mr. H. W. Waldron were accepted.

NOMINATING COMMITTEE.

The President appointed Messrs. C. F. Prichard, S. J. Fowler and F. C. Sherman a committee to nominate officers for the ensuing year.

WELCOMING THE VISITORS.

The President at this point extended a hearty welcome to the members of other Associations, as well as other visiting members of the fraternity, and hoped that they would practically join in the proceedings.

REPORT OF THE TREASURER.

Secretary and Treasurer Gifford read his annual report, which showed receipts for the year amounting to $903.82 and expenditures amounting to $663.19. The total balance of cash in hand was returned at $826.40. On motion, the report (which had been indorsed by the Board of Directors and an auditing committee) was accepted. On motion of Mr. Prichard a

TELEGRAM TO THE MICHIGAN GAS ASSOCIATION,

in session in seventh annual meeting at Detroit, extending congratulations and good wishes, was ordered forwarded.

LETTERS OF REGRET.

The Secretary read many letters, from persons prominently identified with the gas industry, regretting the inability of the writers to respond in person to the invitation to be present at the meeting. Amongst the communications of this nature was one from Mr. T. C. Jones, Secretary of the Ohio Gas Light Association, who, on behalf of the latter, extended an official invitation to the New England Association to join in the Ohio's meeting, to be held in Columbus, O., March 21 and 22. On motion of Mr. Harbison, the invitation was formally accepted, and Secretary Gifford was instructed to so notify the Ohio Association.

The President then read as follows his

INAUGURAL ADDRESS.

To the New England Association of Gas Engineers:

We meet today, in this last year of the century, to celebrate our 30th annual meeting. We thus face a new century and a new decade for

progress. There is something very personal about a birthday anniversary, and it justifies and perhaps is the origin of the customary presidential address. Your president is one of your number detailed to assume, for the time being for the whole Association, retrospective and contemplative powers which should be exercised within the limits prescribed by the articles of agreement of the Association, the preamble of which reads, "Whereas, The manufacture and supply of gas has become one of the largest economic interests in the country; and, whereas, it is most important to the manufacturers and to the public that the best processes known shall be employed in its manufacture and distribution; and, whereas, it is most desirable to obtain the advantage of the experience of the gas engineers scattered throughout New England upon the various problems presented for consideration, we, the undersigned, hereby agree to associate ourselves for the above named purpose * * *"

The past year has been a period of great commercial activity in all lines. This fact has doubtless had its due influence in increasing both our gas and electric light sales. Our satisfaction is somewhat modified by the large increase in the price of all materials and supplies. To single out one commodity as illustrating this fact more than some other would require special study. One fact stands out most prominently—there has been no advance in the price of gas. Even the railroads have advanced their charges for transportation. This increase in the price of materials used in gas manufacture by very large per centages must affect companies working under close management, and under supervision of established authority, in reduced dividends or entire cessation of dividends, or resort must be had to the prevailing method by increasing the selling prices for gas. Such gas undertakings without such increase would otherwise present the curious anomaly of poverty in the midst of plenty. No present or prospective increase in business will compensate for the advance in cost of materials we have witnessed and are still witnessing. Within a week I read that enormous shipments of coal to England will increase the cost of Pittsburg coal 50 cents per ton. Increase in business involves increase in facilities for handling this business. The capital for undertaking it should be cared for out of the profits on this increase. We are in a period when the normal policy would curtail new construction. I am impressed with the fact that the history of the New England gas business is being added to so rapidly that the prophet must be indeed a prophet, and be certain that his inspiration is indeed inspiration, ere he dare prophesy the coming events.

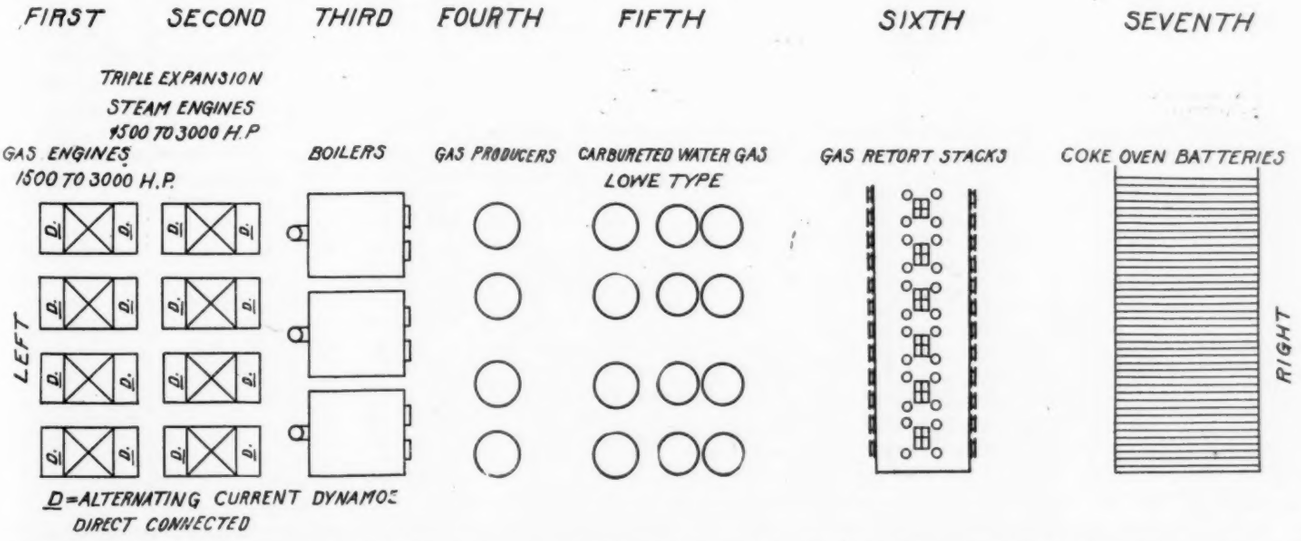
I am by disposition optimistic, and I bid the future welcome. I am sure of one thing—we are all as citizens ready to perform our duty by our country, our State, our community and our corporation. The higher the quality of management required the closer we are required to attend to our respective duties and the more valuable do we become as engineers to our companies. Appreciation for our Association and society meetings is intensified by the demands made upon us. Let us make good use of such opportunities as may present themselves to-day.

The most prominent undertaking in New England at this time is that of the New England Gas and Coke Company and the Massachusetts Pipe Line Gas Company. We are fortunate in having the Chief Engineer of these Companies enter into our discussions. I believe that you will be impressed with the fact that, as a descriptive title, "The New England Coke Company" would have been more appropriate for this Company to have chosen.

In the production of coke gas is but a small factor, and if the plant is conducted entirely on a coke producing basis the maximum demand period may not be found to be coincident with that of the gas business. It is the present impression that gas producers will be convenient for this reason, and likewise to care for the variations in atmospheric conditions. That heat and cold, wet and dry weather must have appreciable effect on the quantities of gas required for heating the vast ovens of this process is self-evident. If coke were used for fuel, as in your retort furnaces, this would be equally true, but the requirements of the coke trade are not so inexorable as the gas output. You can say to your coke consumer, "No coke for sale to-day;" but your gas consumer has the matter in his own hands. The increased demands on the gas by the ovens and the gas consumer are coincident. In cold weather for heat, in both cases, and in wet weather by the ovens for driving out the moisture from the coal and from the oven structure, and by the consumer because wet weather means dark and frequently raw days. But the gas producer will also fill another place. It would be indeed an odd coincidence if the line of available surplus gas, and gas of satisfactory quality to be available for city use, should exactly correspond. If any of the gas now by necessity used for heating ovens is of satisfactory candle power and purity, its replacement by producer gas is natural. Producers will, therefore, give an elasticity to the plant that would not be undesirable. I am sure we can congratulate the management of the Companies upon the candle power and the purity of their gas, though made from coal higher in sulphur than the gas coal most of us are fortunate enough to be able to obtain. Tight ovens and large purification capacity are the primary essentials that bring about this result.

While on this subject I cannot resist musing for a moment. Imagine a vast area having the following apparatus arranged in parallel rows multiplied indefinitely. Beginning at the left:

1. First, a long line of 1,500–3,000-horse power gas engines, with alternating current dynamos direct connected and supplementing.
2. Second, a long line of triple expansion, vertical steam engines of 3,000-horse power each, direct connected to alternating current dynamos of appropriate k. w. capacity.
3. Third, a long line of boilers drawn up like a regiment of soldiers, with ample firing room space to the right and fronts fitted with automatic stokers, facing on the same firing floor and opposite the boiler fronts.



4. Fourth, a long line of producers fitted with up-and-down air and steam supply.
5. Fifth, a line of water gas apparatus of the Lowe type.
6. Sixth, a line of inclined retort stacks.
7. Seventh, a line of coke ovens.

Appropriate condensing and purifying plant and holder are readily conceived to care for the retorts and ovens and water gas apparatus.

What could we do with such a plant?

A. The gas engines could supplement the steam engines by using either producer gas, poor run-of-coke oven gas or illuminating gas, de-

pending upon the demands made on these products or the desire of the management.

B. The steam engines would turn the steam from any boilers in use into a.c. electricity. This power could be of any desirable voltage, and be used for all the railways and electric lighting companies of the community, using step-down transformers, constant current transformers, rotary transformers, etc., depending upon the work required.

C. The boilers could be fired with coal or coke, by stokers or by automatic stokers, or by means of the producers opposite, or by means of the gas from the coke ovens when producing beyond needs for other useful purposes.

D. The producers could supply the boilers with heat as stated, but they could also supply the gas engines with producer gas as well as the coke ovens with heat. And also blue gas could be made for the Wilkinson process.

E. The water gas apparatus would supplement the coal gas apparatus and allow the retorts and ovens to run at constant and uniform rate independent of gas demands.

F. The inclined retorts would produce a steady supply of illuminating gas. We would here use the least weights of coal for the greatest number of feet of gas. The coke would be used when suitable for the demands of the community, any surplus to be used in the station—under the boilers for instance.

G. The coke ovens would supply partly the illuminating gas demands, and perhaps gas to factories adjoining, for tempering and furnace requirements when exact ranges of temperatures are essential. The producers would care for the oven demand.[1] Metallurgical coke or other grades could be produced at will.

I do not need refer to the tar establishment and ammonia house which would be a necessary adjunct to this plant.

Yes, fellow members of the New England Association, I am musing; but turn it over in your own minds, if only to satisfy yourselves that this is no time to be pessimistic as to the future of your profession. I dare to say in the face of possible misapprehension that the gas business of the future will be conducted by men who, while combining knowledge of engineering, civil, mechanical and electrical, and of metallurgy and chemistry, must also have business experience in their profession such as you have or are obtaining from day to day and year to year. I know of no profession requiring such a wide range of knowledge, practical and theoretical, as this same gas business that seems so simple in its processes. Do not permit the opportunities to slip from your grasp. If your sons are to follow in your footsteps see to it that they strive for a high standard of excellence.

Gas Engines.

Not very many years ago but one or two makes of gas engines were on the market; to day new names present themselves in any technical journal you may pick up. The horse power of gas engines is now measured by thousands. We are chiefly interested in the smaller powers. I present a few figures based on a 10 horse power engine with dynamo attached, including foundations, switchboard, etc., complete for electric lighting and other power purposes gas is assumed for convenience at $1 per 1,000.

Cost per Horse Power, $176.50; *Gas at* $1 *per* 1,000.

	Load—	Full.	Half.	Quarter.
1.	Efficiency	100 per ct.	60 per ct.	51 per ct.
2.	Cost gas per horse power, cents	1.8	3.0	3 5
3.	Cost per k. w., cents	3.0	5.0	5.83
4.	Cost per i. lamp hour, cents	.18	.3	.35
5.	Cost per arc lamp, cents	1.8	3.0	3.5
6.	[2]Interest, depreciation and repairs, per horse power hour	.88	1.76	3.42

I believe the day is coming when the electric light company will find the gas engine a factor in the competition for the business of supplying electric light to the large office buildings and department stores.

Electric Lighting Stations.—To those of you who have electric lighting stations the modernizing of your stations is an interesting study. Study of the subject convinces me that compound and triple expansion engines, direct connected to alternating current dynamos, are to be used exclusively for our stations. If the alternating enclosed arc can be successfully and satisfactorily used on an extensive scale by the use of constant current transformers, our main supply lines can be kept at a minimum. A 500-volt power circuit can care for the elevator and power and railway service by means of rotary transformers. Keeping the power and lighting on separate circuits has its advantages. The lighting circuits being more likely to fail, the consumer has gas to fall back upon. The following figures are suggested as probable efficiencies deduced from a consideration of the subject:

	Efficiency from throttle to switchboard at maximum load may reach
Station having compound engines with belt driven jack shafts driving alternate and direct current dynamos for both arcs and 500 vt. power	75 per cent.
Station having compound engines direct connected to alternating machines; alternating current arcs and rotary transformers for 500 vt. power current	88 6 "
Same, except with alternating motor driven, direct current arcs	85 "

The unaccounted-for current in electrical circuits I find to be as important a subject for observation as the unobserved gas unaccounted for. It is not alone necessary to have a perfect station service, but the process of "scrapping" electric machinery and buying better has an appreciable effect on gas competition.

One is led to believe, when first attempting to run both plants—illuminating gas and electric light—that they are in competition. They are; but the demand for electricity is entirely independent of its cost and must be met. The best result obtainable is, therefore, essential to keep up with the times.

The Wright Discount Meter is destined, it would seem, to increase in use as time goes by.

Gas engines for producing power for electric stations is a subject that will repay your attention. I would not confine your investigation to illuminating gas, but consider the utilization of blue gas and producer gas and a mixture of the two. Natural gas is used on these large engines where it is obtainable.

Electrolysis.—Electrolysis is still a subject for careful consideration. I recommend that you appoint a standing committee to keep in touch with the subject, and with authority to correspond with any committee of any society which has authority to consider it. I wish to emphatically disavow any intention by this suggestion to revive the federation scheme which gave me much fruitless work some years ago. Federation principles can be successfully carried out by more than one Association on the lines of a Democratic rather than an Oligarchic form of government.

The Prepayment Meter.—This apparatus is still a bone of contention. If it were universally conceded that it was the correct thing to make an extra charge of, say, 15 cents per 1,000 for gas sold through this form of meter, I conceive that any opposition to the meter would disappear. I assume, then, that the prepayment meter as a mechanical contrivance is not the bone of contention. I have made a study of an important matter lately and I am going to call the attention of the Association to it at this time.

If you turn to the Gas Commission reports of past years you will notice that the sales of gas through meters is less per meter than it formerly was. The following table illustrates this:

	Gas Sold per Consumer. Company.		Gas Sold per Meter Light. Company.	
Year.	—Boston.	So. Boston.—	—Boston.	So. Boston.—
1887	37,475	20,169	3,837	5,599
1888	37,507	20,927	3,609	4,115
1889	37,877	21,440	3,934	4,229
1890	38,195	22,091	3,796	4,325
1891	44,069	23,419	4,216	4,620
1892	46,427	23,831	4,453	4,668
1893	46,927	27,831	4,457	5,531
1894	37,623	24,730	3,701	4,939
1895	36,442	23,654	3,712	4,664
1896	34,410	18,177	3,572	3,867
1897	36,417	22,240	3,807	5,049
1898	36,893	22,883	3,812	5,213
1899	36,759	21,355	3,819	4,904

You will at once conclude, and correctly I think, that the large consumers of gas have been the ones discontinuing the use of gas in favor of electricity made by central stations and private plants. The electric company's average consumer is one who is better off financially than the average gas consumer. As evidence of this it is the custom in many electric light companies to charge a minimum rate of at least $1 per month, to even the smallest consumer. In connection with studies on the price of gas in the abstract, I found I needed certain facts to help me bring my preconceived notions, amounting to belief, to hard, cold facts. Obtaining the co-operation of the Treasurer's domains, I found facts that well nigh overpowered me, and I am going to produce some of them.

1. It is to be noted in passing that the fitting up of coke ovens, to do the identical work coal gas through retorts do in the Wilkinson process, is but the work of the gas engineer. The gas producers (D) would furnish the blue gas required.

2. Attendance may be taken at 2½ times this (6) amount if a man's entire time should be devoted to this small plant. This should not be the case. The cost per horse power, exclusive of foundations, dynamos, switchboards, etc., for large powers, may be assumed between $50 and $60.

Number of Meters Registering as Indicated.

Registration in Cubic Feet Between	Company A. Dec., 1898.		July, 1899.		Company B. Dec., 1898.		July, 1899.		Cos. A, B, C, D, E Dec., 1898.	
	No.	Per Ct.	No.	Pr. Ct.	No.	Pr. Ct.	No.	Pr. Ct	No.	Pr. Ct.
0– 100	4,237	14 71	10,877	38.5	130	2 66	482	9.7	12,375	15.88
100– 1,000	4 896	17.00	6,294	22.1	1,578	32 32	2,259	45.5	14,062	18.05
1,000– 2,000	4.904	17.1	4,985	17.58	1,573	32.32	1,309	....	16,741	.....
2,000– 3,000	3,479	12 1	2,503	8.8	650	13.31	439	....	11,199	.....
3,000– 4,000	2,452	8.51	1,198	4.21	331	....	203	....	6,729	.....
4,000– 5,000	1,808	6.53	644	2.27	191	....	78	...	4.869	.....
5,000– 7,000	2,386	8 35	683	2.40	183	....	73	....	4,322	.....
7,000–10,000	1,958	6.8	525	1.85	107	....	62	....	3,284	....
0–10,000 ft.	26,120	90.8	27,709	97.5	4,743	97.1	4,905	98.7	73,581	94.00

The figures to me are most remarkable. Taking Company A, nearly 22 per cent. of the meters measured less than 1,000 feet in December, and nearly 61 per cent. measured less than 1,000 feet in July.

The Company is subject to electric light competition, and the people leave the city to summer to great extent in certain districts. In Company B, 35 per cent. of the meters measured less than 1,000 feet in December, and 55 per cent. of the meters measured less than 1,000 feet in July. Here electric light competition cuts little into the gas business and the people do not leave their homes universally.

In the combination Companies A-C, in December, 34 per cent. of all meters burn under 1,000 feet, and 94 per cent. of all meters less than 10,000 cubic feet. Below is an isolated record of prepayment meter which gives an extraordinary large return. Our records show no gas gas having been used at No. 10 Causeway street, though the building had been provided with a service for 20 years. One of our solicitors arranged for a prepayment meter at this place in October, 1897. This building is within two blocks of our old North End station. The money collected from meter is as follows:

1897.	1898.	1899.	1900.
Jan.....	$10.50	$9.25	$9.50
Feb.....	9.25	10.00	18.00
March.....	3.50	8.00	....
April.....	11.50	9.00	....
May.....	8.25	8.25	....
June.....	6.75	4.25	....
July.....	6.25	4 00	....
Aug.....	6.50	8 75	....
Sept.....	7 00	5 75	....
Oct.....$6 00	7.25	11.75	....
Nov.....11.75	8.50	20.75	....
Dec..... 9 80	8.00	11.75	...
Total.....$27.55	$93.25	$111.50	

Now, in the face of the facts deduced in the tables above, are these not fair questions: (A), Will the introduction of prepayment meters stimulate the use of gas when the present use is restricted; and, (B), Will not the prepayment meter tend to increase the average use of gas per meter per month.

Technical Gas Press.—During the past year gas publications have been filled with valuable matter. I am glad to see them publishing increasing quantities of matter on steam and electricity. Quotations of coke, cast iron, ammonia, tar, etc., are not less welcome. We owe a debt to the gas press not measured by the subscription price.

Incandescent Gas Lamps.—Anyone driving or riding throughout the city of Boston and town of Brookline, will be struck with the improved lighting of the streets at night, the 4-feet glycerine burner being replaced by the standard Welsbach street light. I hope to see boulevards lighted by 4 rows of Welsbach lights before long. Driving in a shady street is now made more safe for the driver, as well as walking for the pedestrian. The investigation of this matter will repay you. You remember that last year Mr. Fowler touched upon the desirability of this method of street lighting.

Gas Stoves.—New designs of gas stoves are coming forward with ever-increasing attractive features. Excellent combination gas and coal ranges are in the market for the use of those who do not desire to be entirely without a coal stove and yet have no room for two stoves.

Paris Exposition.—Your Association has, through your President, received a communication from the "Société Technique de l'Industrie du Gaz," calling attention to the meeting of the International Gas Congress, in Paris, September 3d, 4th and 5th, 1900. I would suggest that a committee of three be appointed, with power to increase their number, to represent your Association at the Paris Exposition. I would suggest that they also be requested to submit a subject to be treated of by the Congress. "Electrolysis," "Gas Stoking Machinery," "Inclined Retorts," "Coke Ovens," "Gas Engines" and "Pre Payment Meters," are all subjects which would be of great interest, treated of internationally.

In the spirit of the preamble likewise, your Secretary, Mr. N. W. Gifford, sent to each member a postal card, dated New Bedford, Mass., 9 month, 1899, a copy of which is appended as "Exhibit A." This was followed by a circular letter, signed by your President, dated January 20th, 1900, as in "Exhibit B."

Secretary Gifford followed this with his notice of February 1st, 1900, as in "Exhibit C."

The replies from members have been of assistance to Mr. Gifford and to me, and I desire to take this opportunity of acknowledging this and thanking the members for their assistance. The subject matter of this meeting has been influenced by expressed desires of one and another. Messrs. Allen, Goulding, Shelton and Waters have formal papers on subjects, two of which, while treated of previously, are not exhausted, and careful listening to all of these essays will be conducive to profitable discussion. Your particular attention is directed to the programme Mr. Gifford has prepared, if the notice in the AMERICAN GAS LIGHT JOURNAL has escaped your notice. Two "Topics" for general discussion have been provided:

1. Coke Oven and Retort House Construction and Results.
2. Under-water Gas Main Construction.

The discussion on the first will be opened by Messrs. Hirt, Mayer, Ramsdell and Slater, Jr., which will draw out other volunteers, I hope. The second will be opened by Messrs. Coffin, Gould, Hirt and Slater, Sr., and I am sure will prove equally interesting.

I wish to express my appreciation of the interest displayed by the gentlemen not members who have consented to give you information they have, and that I am sure you will one and all profit by in the hearing. I wish to say that we should be considerate in our treatment of this information, and, in our thirst for more, not press them for more than they feel it is convenient to offer at this time.

I would be glad if any member desiring to speak, but not for publication, will indicate his wishes, which will be respected by the press represented.

It is a matter of deep regret that death has removed from us several of our members.

Hon. W. W. Greenough, former Treasurer of the Boston Gas Light Company, and first President of this Association. His name is as widely known as gas undertakings exist. He passed away June 17, 1899.

Mr. Gustavus E. Wetherbee, June 10, 1899, while Superintendent for the Roxbury Gas Light Company. He had been in various positions in the Roxbury, Boston, and Worcester Companies.

Mr. L. P. Gerould, formerly of Nantucket, Mass., November 27, 1899. But lately retired from active management of any Company.

The appointment of committees to submit resolutions to the Association will doubtless receive attention. We are to be congratulated that, in spite of the serious illness of several of our members, they have recovered and are with us to-day. One of our Past Presidents, and one other member, I understand are seriously ill, and I hope a message of good cheer may be sent them. Mr. Tabor was the President when I first joined this Association, and I shall remember with pleasure the cordial welcome he gave the new members.

EXHIBIT "A."

OFFICE OF THE SECRETARY,
NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.
NEW BEDFORD, MASS., 9 MO., 1899.

Dear Sir: It is very much to be desired that future meetings of this Association shall be as interesting and helpful to members as those of the past. This will depend very much on the members themselves; and to make this so will you kindly see if there is not something in your season's work which will be of interest to the other members, and which you can present at the next meeting in a "Paper," "Short Topic" or the "Question Box"?

Or, has there anything come to your notice which you would like to have discussed at the next meeting of the Association? And, if so, will you suggest some one as the author of such discussion?

Also, can you suggest the name of any who ought to be members of this Association, to whom application blanks may be sent.

Please give this your careful attention, and reply on attached postal card. Yours very truly, N. W. GIFFORD, Sec.

EXHIBIT "B."

BOSTON, MASS., Jan. 20, 1900.

To the Members of the New England Association of Gas Engineers:

Your Secretary, Mr. Gifford, has already written to the members in regard to papers and subjects that would interest the members. The replies received do not encourage us much, and I desire to again call

the members' attention to the necessity of having some volunteers to insure the success of our annual meeting. You are earnestly requested to communicate with Mr. Gifford or me, if you can see your way clear to give the Association a paper on any subject that you believe would be suitable. Please do not lay this aside before at once communicating with Mr. Gifford or me.

This is a matter that, while of personal interest to Mr. Gifford and to me, is also particularly important for the welfare of your Association. Is it not your duty to help in some way? We are doing all we can, but need your help. I am, very truly yours,

W. R. Addicks, Pres.

Exhibit "C."

The Council of the Société Technique de l'Industrie du Gaz en France has taken the initiative in proposing a re-union in an International Congress, on the occasion of the Universal Exposition of 1900, of all the Societies similar to itself, and of all persons who are interested in the progress of gas industry.

"This Congress will be held in Paris, 1900, and very probably on the 3d, 4th and 5th of September, at the Exposition, in the Hall of Congresses.

"It has seemed to us that a reunion of this nature could give useful results in bringing about an exchange of views upon the most important points of the manufacture and utilization of gas as well as upon questions which are attached to these subjects.

"It seemed to us all the more opportune because there has never been, up to the present, a Universal Congress devoted to the gas industry, and it is to be hoped that this first reunion will evoke a great interest. It will form, moreover, bonds of friendship and fraternity between all the representatives of our industry which cannot help but be profitable to this industry itself. It is in this spirit that we come to invite your honorable society to take part in this Congress.

"We have thought that it was not necessary to fix as yet in a definite manner the programme of the transactions of the Congress, but from now on we will busy ourselves in examining a certain number of questions which could be usefully treated, and we will be very much obliged to you if you would make known to us those which you judge could appropriately be placed on the programme.

"We will receive with gratitude all the observations and propositions which you will be kind enough to address to us.

"The Committee of Organization will afterwards fix and send to you the definite programme of transactions, which will comprise, besides technical questions, visits to the Exposition and to various works, a banquet offered by the Société Technique du Gaz to all the members of the other Societies, etc.

"If, therefore, as we earnestly hope will be the case, you will kindly reply to our appeal we will be very grateful if you will send in three copies, and with the least possible delay, of the list of your active members, which we will communicate to the General Secretary's department of the Exposition, and, either by his care or by our own, you will receive in ample time the programme of the Congress, as well as the steps to be taken in order to join it."

Committee on President's Address.

The address was referred to a committee of three (Messrs. S. J. Fowler, C. D. Lamson and C. J. R. Humphreys), with instructions to report their consideration thereof at a later period.

The Secretary read the

ROLL CALL,

the following members responding to their names:

Active.

Addicks, W. R., Boston, Mass.
Africa, W. G., Manchester, N. H.
Alden, A., Watertown, Mass.
Allen, B. J., Allston, Mass.
Allyn, H. A., East Cambridge, Mass.
Amory, Dr. R., Boston, Mass.
Anderson, W., East Boston, Mass.
Bartlett, L., Cottage City, Mass.
Barnum, D. D., Worcester, Mass.
Coffin, J. A., Gloucester, Mass.
Coggeshall, H. F., Fitchburg, Mass.
Cook, R. W., Peekskill, N. Y.
Cooper, A. F., Exeter, N. H.
Coyle, P., Charlestown, Mass.
Crafts, H. C., Northampton, Mass.
Davis, F. R, Athol, Mass.
Fowler, S. J., Springfield, Mass.
Gifford, N. W., New Bedford, Mass.
Gould, J. A., Boston, Mass.
Goulding, N. O., Natick, Mass.
Harbison, J. P., Hartford, Mass.
Hassett, E. J., Beverly, Mass.
Humphreys, C. J. R., Lawrence, Mass
Humphreys, J. J., Jr., Worcester, Mass.
Hurlburt, S., Norwich, Conn.
Jenks, Z. M., Woonsocket, R. I.
Jennings, F. W., South Framingham, Mass.
Lamson, C. D., Worcester, Mass.
Lane, H. M., Leominster, Mass.
Leach, H. B., Taunton, Mass.
Learned, E. C., New Britain, Conn.
Learned, W. A., Newton, Mass.
Learned, C. A., Meriden, Conn.
Lucey, F. J., Natick, Mass.
Macmun, G. F., Marlboro, Mass.
Manchester, G. L., Easthampton, Mass.
Mansfield, G. W., Salem, Mass.
McGregor, W., Pawtucket, R. I.
McKay, W. E., Boston, Mass.
Mooney, E. B., Brockton, Mass.
Morrison, H. K., Concord, N. H.
Moynahan, J. F., Stoneham, Mass.
Neal, G. B., Charlestown, Mass.
Nettleton, C. H., Derby, Conn.
Norton, H. A., Boston, Mass.
Norton, W. F., Nashua, N. H.
Norton, P. T., Nashua, N. H.
Nute, J. E., Fall River, Mass.
Nutting, C. H., Chicopee, Mass.
Nutter, E. J., Milford, Mass.
Parker, F. H., Burlington, Vt.
Prichard, C. F., Lynn, Mass.
Richardson, F. S., North Adams, Mass.
Rossman, G. M., Keene, N. H.
Shelton, F. H., Philadelphia, Pa.
Sherman, F. C., New Haven, Conn.
Slater, A. B., Providence, R. I.
Slater, A. B., Jr., Providence, R. I.
Snow, W. H., Holyoke, Mass.
Spaulding, C. F., Waltham, Mass.
Spaulding, C. S., Newburyport, Mass.
Spaulding, W. H., Westerly, R. I.
Stearns, W. M., Waltham, Mass.
Stratton, W. K., Haverhill, Mass.
Tilton, D. D., Newburyport, Mass.
Todd, J. R., Walnut Hill, Mass.
Willard, A. T., Greenfield, Mass.
Wood, W. A., Boston, Mass.
Woodward, R., New Rochelle, N. Y.

Associate.

Barnes, A. M., Cambridge, Mass.
Browne, A. P., Boston, Mass.
Coburn, C. M., Chelsea, Mass.
Cortis, D. T., Boston, Mass.
Davis, F. J., Waltham, Mass.
Hinman, C. W., Charlestown, Mass.
Holmes, R. E., Winsted, Conn.
Homes, W., Boston, Mass.
McKenney, W. A., Boston, Mass.
Mace, F. W., Lynn, Mass.
Scranton, G. H., Derby, Conn.
Thomas, F. W., Boston, Mass.
Tufts, J. P., Boston, Mass.
Waldo, C. S. Boston, Mass.
Waldo, J. A., Boston, Mass.

Appointment of Committees, Obituary Resolutions.

The President announced the following committees to prepare suitable mention respecting deceased members:

On the Hon. W. W. Greenough.—Messrs. C. D. Lamson, C. H. Nettleton and H. A. Allyn.

On Mr. Gustavus Wetherbee.—Messrs. J. A. Gould, Wm. Anderson and C. F. Spaulding.

On Mr. L. P. Gerould.—Messrs. A. B. Slater, Jr., F. C. Sherman and H. B. Leach.

The President introduced Mr. F. H. Shelton, of Philadelphia, Pa., who read the following paper entitled

PUMPING GAS FIVE MILES AT TWENTY POUNDS PRESSURE.

Mr. President and Gentlemen of the Association: Last June I read a paper before the Western Gas Association, at its 22d annual meeting, in Milwaukee, entitled and advocating "Distributing Gas Under Higher Pressure."[1] I pointed out that steam, ammonia, air, oil, water, Pintsch gas, natural gas, and other fluids are daily safely distributed and handled in public places at many pounds pressure, in contrast with illuminating gas at but a few inches pressure (or but the fraction of one pound), and that the traditional practice of using but a zephyr-like pressure, involving large and costly pipes to send gas some distance, is relatively wasteful of energy and expensive, and, when analyzed, but little short of ridiculous. I contended that mechanical appliances, as well as precedents, were now sufficient to warrant distributing illuminating gas at several pounds pressure, and that such a plan of working should be and could be made entirely satisfactory, and would save enormously in the investment required. Since reading that paper, considerable further thought upon the matter has brought the settled conviction that transferring or distributing artificial gas at high pressure involves neither any great experiment nor any particular risk. An opportunity a short time ago presented itself to demonstrate my belief, despite the solicitous concern of several pessimistic friends, I assumed the responsibility of constructing a high pressure system. It has worked perfectly satisfactorily, and from the start. I have the pleasure of describing it herewith.

Phœnixville, Pennsylvania, 28 miles above Philadelphia, on the Schuylkill river, is a manufacturing town of 10,000 population. Spring City and Royersford, some 5 miles above it, are smaller towns adjoining, on opposite sides of the river, and together form a gas district of 6,000 people. In the intervening distance between it and Phœnixville there are a few farm houses, and a county almshouse about midway. Each district has had a gas company for many years. The plant at Phœnixville was fair; that at Royersford was wretched. The Consolidated Schuylkill Gas Company, organized by myself and associates, acquired, October 1st, possession of both plants. It was decided to lay a high pressure connecting main from Phœnixville to Royersford, shut down the plant at the latter point and make all gas at Phœnixville. Work on the pipe line was started October 27th. Gas was pumped through within 64 days—December 29th. Since that date, the Royersford district has continuously procured its gas from Phœnixville, without either trouble or the suggestion of trouble.

The connecting pipe line is 23,015 feet—or about 4½ miles—in length,

1. See Journal, July 17, 1899, p. 84.

three-inch size, and, of course, of wrought iron. To protect against corrosion, it was suitably coated after being strung along the road, and recoated in part after joining in the trench. The pipe is heavier than the ordinary; special threaded connecting sockets were used, and provision was made for protecting threads in shipment from pipe mills to ditch. It is bedded 3½ to 4 feet deep in natural earth from end to end. Two thousand feet of the run was through rock requiring blasting; 10,000 feet was through more or less shale and surface rock. Midway, it passes through an old-fashioned, covered, three-span, wooden bridge, 600 feet long, crossing the Schuylkill river, being attached to the trusses 7 feet above the drive level. Certain weather casing was here provided. At one point, over a stone arch road bridge, the pipe has but 15 inches covering for a distance of 60 feet. It runs along a public highway throughout, excepting one stretch of 1,200 feet through fields, private ground. In its run it crosses under a three-track, trunk-line railroad. Valves are inserted at intervals, and adjoining the bridge, for use in the event of freshet or fire affecting the latter, and to facilitate the locating of any possible future leaks. Drips are provided. The run is fairly hilly. Some provision was made for contraction and expansion. As each 1,000 or 1,500 feet of pipe were added, the line was tested throughout with air pressure, from a power compressor at the works, to 60 pounds. Despite all foresight and care, leaks were usually found. These were corrected, and a second test made, and not until the line stayed tight for hours, was final filling in of the ditch permitted. When the line was finished, it was bottle-tight, end to end, as proven by 60 pounds test for hours. A wire was laid alongside in the trench from end to end, to enable the use in the future of any desired electric alarm, call bells, recording or signalling apparatus. A number of other construction details and adjuncts were incorporated, not necessary to here take up at length.

The pumping machinery at the starting point is a straight line, steam driven, air compressor of the usual type, but altered for handling gas. The steam and gas cylinders are each 8 inches by 12 inches, and the listed capacity at 140 revolutions of free air at atmospheric pressure is 5,820 cubic feet per hour, with a duty of indicated horse power of about 20. This compressor draws gas at ordinary pressure from the holder, a station meter with by-pass intervening. It is located near the water gas apparatus, and is attended to by the gas maker. No extra labor is employed. The space occupied is about 2 feet by 8 feet, and its weight is slightly over 1 ton. Its cost, including governor, gauges, setting, freight, foundation, etc., was about $1,000. It is so run as to maintain 10 to 20 pounds pressure on the pipe line. Provision was made for adding a duplicate compressor. Gauges and other minor appurtenances were provided.

Principally because of quick delivery, two regulators or governors were used at the far end to reduce the pressure from the pipe line to the customary 2 or 3 inches. The first, with 3-inch connections, is built to reduce from 50 to 2 pounds. The second, with 6-inch connections, from 2 pounds to 2 inches. They are of the dry, non-freezing diaphragm type. They are relatively inexpensive and seemingly perfect in action. The gas after being reduced in pressure at the gas premises in Royersford, passes into a gasholder of 10,000 cubic feet capacity, from whence it passes into the street mains in the usual fashion. Connections are made, however, so as to enable by-passing the holder and the throwing of the governors directly on the town. The low pressure, 6-inch connections are sufficient for the present, but 8 inch will be a later size, and are partly in place. Suitable gauges, safety appliances and other features are covered in the valve room at the terminus of the line. The equipment within the room represents a cost of about $500. Taking this figure and the cost of a compressor as about the sum already given, plus the cost of any given size pipe line laid per mile, one can approximate the cost of a complete high pressure installation.

As to operation: The gas handled is a straight illuminating water gas of 20 to 22-candle power, made from naphtha on a machine of the Lowe type, but of bad design. The single superheater is smaller in diameter than the generator and the fixing surface scant. This will ultimately be corrected, but observations so far have been upon gas made on the machine as above. Each morning the gas maker at Phœnixville runs the compressor for about 2 hours and pumps enough gas up the valley to fill the holder at the Royersford works. Pumping then ceases, and the Royersford and Spring City supply is maintained from the local holder. About 5 o'clock it is nearly emptied and pumping is resumed and continued, until perhaps 8 o'clock, when the holder is left full for the night. Royersford signals Phœnixville when to start and when to stop pumping. The compressor is run at a rate 25 per cent. less than its listed speed and handles thus in practice about 4,000 feet per hour. This means a capacity of about 100,000 feet per day. This is at relatively low pressure. By increasing the speed and the pressure and alteration of governor adjustments, the pipe line can deliver much more in the future, when necessary. While pumping there is a loss of 2 to 3 pounds pressure at the far end, due to friction. Between periods of pumping, the pressure equalizes and is left on the pipe line, and in 8 to 12 hours over night it drops from 1 to 3 pounds. This is not pipe line leakage, but is due to the consumption of customers so far taken off the line, changes in temperature, slight condensation, differnce in gauges, leakage around valve stems, etc. The cubic capacity of the line is about 1,200 feet.

The skeptics as to the success of the plan of handling—as herein described—illuminating gas at 20 pounds pressure told me there would be considerable loss of candle power from the compression, that the governors would not be reliable, that condensation would trouble us, that the high pressure in the pipe would be dangerous, that corrosion and leakage would shortly follow, and that breakdowns of the pumping machinery would imperil the general supply. We have been working now for nearly 2 months; we do not find the trouble predicted.

There is no visible difference in the candle power because of the compression and long-distance delivery. The regulators have not misbehaved a particle. We find them to be entirely reliable and dependable. The condensation is slight, is mostly caught at the beginning, and involves no trouble to take care of.

There are no signs of probable breakdowns. The compressor works as smoothly as could be desired. Duplicate parts in stock at moderate cost will enable the quick replacement of anything that is likely to break, as the holder at the far end gives at present a storage capacity sufficient to permit of changes, alterations, etc. When it is done away with, as is the expectation before long, a duplicate compressor will first be added, which can be started up in 30 seconds in the event of breakdown of the one operating.

We have no leakage on the pipe line, and its construction is such that we are certain that it will last for very many years before such occurs, or repairs or renewals of moment prove necessary. We are satisfied with it. We have not aimed to satisfy others.

The following points may be noted in connection with the general operation:

The amount of drip liquor taken out daily at the compressor, and at the first drip or two out on the line, is about 2 gallons, combustible and largely oil, but with some water in it. Drips examined half way along the line so far are practically dry. The amount of drip recovered is about 2 per cent. of the volume of the oil used in gas making. The temperature of the gas after compression and a couple of hours' operation, with 15 pounds pressure in the pipe line, was noted as 106°. At 20 pounds pressure it was 114°. The outside temperature was 40°. The temperature of the gas after emerging from the earth and passing through the regulators was 54° to 58°. It will be noted that no tank or cushion chamber is used at the outlet of the compressor. There is some pulsation while pumping at the beginning of the line, but no customers exist at that point.

Services along the pipe line where expected were provided for by tees. Additional services can be put in without shutting off the gas, if desired.

In a second high-pressure line that will probably be installed shortly elsewhere, there will probably be used—for the sake of compactness—a single governor, instead of two as on the line herein described, including increased provision for the occasional cleaning of same, as well as a line meter that will measure gas at 50 pounds pressure.

No photometrical observations have yet been made. We have been too busy with the completion of the line and other construction work to do aught else than get things finished and going in general. All of the figures mentioned in this paper are general and those so far observed, but they are felt to be practically correct.

We have just added midway a branch run of 2,000 feet of smaller high-pressure pipe to the County Almshouse mentioned, with which we will handle a business expected to amount to 500,000 cubic feet of gas in a year. Two house regulators at the far end of this run reduce the gas to the ordinary pressure and control the supply in the buildings, while a third regulator at the entrance to the Almshouse grounds controls a single lamp post. Each and all of these individual customers' service regulators are working as well as the main line regulators, cost but a few dollars each, and show the ease with which business can be taken care of en route on a high-pressure line. A firehouse has also been served by such a regulator for some weeks, and 17 houses on a cross street of 800 feet length are now being connected.

It will be noted that the work done by the above pipe line and com-

pressor is substantially the economical transfer of gas from one holder to another a few miles apart. The two months' operation has demonstrated, satisfactorily to me, that we can pump gas at high pressure, long distances, dependably as to both pumping and regulating mechanism, without trouble as to condensation, at low operating cost, without visible loss of candle power, and on a very low investment cost. I am expecting to further demonstrate that we can serve a town some miles distant with such an equipment *and without the use of a holder*. The regulators have so far worked perfectly on varying supplies and pressures in taking care of the gas passing through them into the holder, and there is no reason why they should not equally well handle and control the gas passing into the town direct. In fact we have already so operated, tentatively but continuously for 2 or 3 days, in preliminary trials and entirely successfully with the holder by-passed and entirely shut off, and we are expecting shortly, by a lengthy trial, to fully prove the last point to be covered, namely, that a high pressure line, with continuous pumping at a moderate rate and duplicate compressors, will safely and dependably supply a town direct, and that no holder is necessary.

The long distance, high pressure delivery here described was started during a cold snap and involved a plan of working entirely new to the men in charge. The gas was made on an indifferent machine and was not overly well fixed. The reconstruction of the works at large to some extent interfered with attention to and concentration upon the pumping department. No station meters were then in use, and the steam supply for the entire gas works, water gas making, heating and all depended upon but a 30-horse power boiler. Despite the above everything worked as smoothly as could be desired, and that such should be so under such conditions, I take it, is some confirmation of my belief that pumping at high pressure can be readily done.

In view of the uniformly smooth working, and the satisfactory results experienced, there is no question in my mind that in most instances the cheapest way to transmit gas long distances will be found to be by several pounds pressure through a very carefully laid small screw pipe. I and my associates are entirely satisfied with what we have done at Phœnixville on the lines described, and are expecting to shortly repeat it on a much larger scale in another and perhaps two other places.

While the pipe line here described is the first of which I have knowledge anywhere in which ordinary 22 candle power illuminating gas is handled at 20 pounds pressure, or thereabouts, it should be remembered that its successful working is but a confirmation of a closely similar operation that has for a long time been conducted by Mr. H. H. Edgerton, in Danbury, Conn., but which has practically been steadily overlooked or ignored by gas men at large. Mr. Edgerton, in pumping for nearly 10 years a 35-candle power, oil-water gas 3 miles through a 2-inch main, and up to 40 pounds pressure, has long since shown the feasibility and low investment cost of supplying a town at a distance by high pressure. Credit for being the first to operate such a system should go to him.

The satisfactory operation of a high pressure line, I am well satisfied, will be closely dependent upon the attention paid to details. It may be thought that anyone can buy a pump, run a line of pipe, attach a regulator, and with such deliver gas at a distance. Anyone can try it, but I am certain that, unless from 20 to 30 specific, definite details, of both construction and operation are sufficiently foreseen and provided for, the result will be but partially satisfactory.

A large part of the success of the Phœnixville line is directly due to the excellent work and care given to seemingly minor points, by Mr. B. S. Walters, the engineer in charge of construction, and I take pleasure in here giving him credit therefor.

Discussion.

The President—First I want to thank Mr. Shelton for the printed copies with which he favored us. They certainly have assisted us very much. I think we can congratulate Mr. Shelton that, notwithstanding this was new construction, he carried out the work so promptly. We are hardly surprised at this, because Mr. Shelton has shown us many times how to do things thoroughly, well and promptly. The discussion of the paper is before you. I am perfectly well aware, gentlemen, that there are comparatively few of us who are undertaking this work, but it certainly is a very interesting subject.

Mr. Anderson—Does Mr. Shelton consider it practical, with cast iron mains and cement joints, to get the effects of high pressure? Would they not have to be all wrought iron mains.

Mr. Shelton—I would not care to use cast pipe for many pounds pressure. I would not use anything but screw pipe on such a system, and properly protected against rust.

Mr. Nettleton—Mr. President, I think most of us hesitate to discuss the paper because we know so little about it. It is a new subject, but it is a very important one, and Mr. Shelton is to be congratulated on having broken the ice so successfully. If it is possible for us all to do as he has done, to make a 3-inch pipe do the same work as a 12-inch, it will be a great step in advance. I can't help feeling, however, that we will all be interested in knowing what the result is 3 or 5 years from now, after he has had some extremely cold weather and the frost has gotten down to his pipe. There is a possibility of leakage that is alarming to me, more alarming than is necessary perhaps, but if by any chance the frost should get down to that pipe and the gas should go out under 20 pounds pressure it might or might not do damage, but it certainly would be a large loss. Undoubtedly by watching the matter carefully they would know at once when a leak started, but with frost 3 or 4 feet deep there would be a difficulty in locating the leak and in making the repairs, the town would probably be in darkness. That might or might not happen with a larger pipe. But as I sized the matter up off-hand it seems to me that the advantage is altogether with Mr. Shelton and this method. I would like to ask the coating that he put on the pipe, and whether in a case of this sort he has considered covering the wrought iron pipe with cement covering? I think all of you are familiar with what is known as the cement-lined water pipe that was quite popular in New England along in the sixties and early seventies. I have seen sections of this pipe perfectly preserved by cement after having been buried 25 years. I don't know that I can say any more, except to congratulate Mr. Shelton on the success he has reached, and I do that heartily.

Mr. C. F. Spaulding—Mr. Shelton, at what distance from the station did the pulsation of gas cease?

Mr. Shelton—About 2,000 or 3,000 feet; perhaps half a mile out of the 4½ miles.

Mr. Fowler—In some mathematical calculations I made last year I found that the loss in carrying gases at these high pressures through pipes was pretty accurately calculated by using the general formulæ which we find in the books as the result of friction. To be sure, in my case it was carried out in steam, which is a gas resulting from the vaporization of water, but in carrying a certain amount of steam through a certain length of pipe of a certain diameter I found that the formulæ that we used for the ordinary circulation of illuminating gas was applicable to steam and, therefore, ought to be applicable to illuminating gas at these high pressures. That is, in other words, if anybody wants to find out the size of pipe he would require to carry gas a long distance at a high pressure, all he has to do is to take the formula that we use for carrying gas at low pressures.

Mr. C. J. R. Humphreys—I have been very much interested in Mr. Shelton's paper, and I think we are all greatly indebted to him for bringing this matter to our attention. I would like to say a word in regard to house governors. Mr. Shelton's scheme, as I understand him, is not only to distribute gas under high pressure from one city or town to another, but he also suggests the same plan as a possibility for distributing gas directly to the consumer; in fact, I believe he is doing so now, as I understand him. I would like to ask him if he has any fear of the house governor getting out of order and throwing the entire pressure on the house pipings and fixtures. I should also like to ask, if he has had such fear, whether he has been able to guard against it in any way.

Mr. McKay—I should like to learn from Mr. Shelton what was the provision to which he refers for the expansion and contraction of pipe, and whether any observation has been taken as to the movement of the pipe lineally in the trench under different conditions of temperature. Also, I would like to learn what he used in making the screw joints, and in what direction the thread is specialized; whether it is a finer thread or a longer thread or a more gradual taper.

The President—Perhaps some member has had experience in connection with Pintsch gas which would be somewhat similar on a smaller scale.

Mr. Barnum—I should like to ask Mr. Shelton if they have any trouble at the point where the pressure is reduced in the governor from 20 or 25 pounds, to the 2 or 3 ounces at which it is distributed. I should also like to ask him what the detail is of the drip for taking care of the condensation in the main line?

The President—We would like to hear from Mr. Nute, of Fall River, Mass., who, I understand, has had some experience in this direction.

Mr. Nute—My experience is very limited. It does not apply to gas through a main under 20 pounds pressure, but about 1 pound as a maximum, and then only for comparatively short times. We built a pusher plant last fall, connecting with several lines of mains going to

outside districts. The mains were of cast iron, laid several years ago. They had become too small to supply the holders of the districts, which are entirely separate from the main works' district. The plant was built intending to run at about 15 inches pressure. As a matter of fact, the pressure we are frequently getting on those lines is 24 inches, or, rather somewhat in excess of 24 inches, for we find that a 24 inch gauge is blown out at times. The plant is working with perfect satisfaction. No difficulty whatever is experienced in any way. The result is to double the amount of gas we formerly ever put into these outlying holders. Of course, one pound pressure is a very different thing from 20 pounds.

Mr. J. J. Humphreys, Jr.—Has Mr. Shelton noted a refrigerating effect at the reducing valve between the high pressure line and the low pressure line and the amount of condensation at that point.

The President—Gentlemen, you have given Mr. Shelton a good many questions to answer, I know; but I think he is quite equal to all that you may ask him.

Mr. Prichard—The only objection that occurs to my mind is whether it would be advisable to carry pipes of this nature through a densely populated district, where there were high buildings and electric cars and sewers and the various things with which we have to contend in city distribution. I imagine, from the description Mr. Shelton gives, that his pipe is practically laid through the country, along a country road, and it occurs to me it would be interesting to know whether he would consider it advisable or safe to lay it through a city.

Mr. W. A. Learned—Mr. Prichard's remarks lead me to ask whether, in Western cities, the natural gas companies are regulated by ordinance as to the pressure they carry on their street mains.

The President—It might be interesting in that direction if Mr. Shelton could tell us whether the natural gas companies are using holders now on their mains, depending on holder pressure. I presume that would come in the question. I don't see any others members rising, so Mr. Shelton we will give you the opportunity to answer the questions which have been asked.

Mr. Shelton—I am very glad to be able to give my ideas for what they are worth on the different points that have been suggested, and on the questions that have been asked. In answer to Mr. Nettleton's suggestion, as to the effect of frost, I would say that the principal reason why we have not worried about what frost would do on our pipe, 3 or 4 feet underground, is because at Danbury, with a 2 inch pipe that has been there for 10 years, they have had no material trouble on that score. That exceeds Mr. Nettleton's time of 3 to 5 years! Their satisfaction and their freedom from trouble of any moment in that direction were the reasons that made me feel that, if the pipe was well laid, and some provision was made, as far as possible, for contraction and expansion, so that there would be the least tendency to pull apart on the threads, we would have no real trouble that way. I would like to say right here that a large part of our warrant for kicking over a little bit of tradition, and for leaving the rut and going into a departure in the way of distributing gas at high pressure, was because of the everyday, ordinary, day-in-and-day-out success and freedom from trouble of Mr. Edgerton's Danbury installation. We have not—I say "we," I mean gas men at large, all of us—I think appreciated what he has been quietly demonstrating there. We have not happened to come across it. We have not happened to observe it. We have had no connection with it particularly. We have not quite realized that he has found it cheap and satisfactory to distribute gas at a considerable distance, and has been doing it for so long a time that the Superintendent and others there very frankly say they do not give any thought to it; they have done it so long they have ceased to think of it; the novelty has long since disappeared. Their pipe line was poorly laid; they frankly said so. They had to correct a little of it. At times they had to go over it more or less. We have profited by their caution and put in our pipe line with exceptional care. I am proud of the work that our men have put into that construction, and I believe, from the way it has been built and from the precedent of Danbury, that we will have no trouble at all from frost. We have been through three cold spells since it has been laid, under operation with gas; we have had no suggestion of rupture or break or trouble so far, and are not looking for it. So far as the coating is concerned, in this particular instance we used a coating that was made in Cincinnati, but not General Hickenlooper's. It comes in convenient barrel form, and has served us satisfactorily in some other work. It seemed very hard, very durable and easy to handle, and we concluded to continue our use of it in connection with this pipe line. On the question of house governors, which Mr. Humphreys asked about, I do not think we are taking any material risk in putting in cast iron governors in the cellars of houses, for the reason that the natural gas people worked that all out for us, in my belief. Ten years ago, 12 or 15 years ago, when natural gas was first brought into the different cities in the West, we recollect hearing about a great many natural gas explosions. The natural gas companies had to work through their preliminary period of how to handle high pressure, had to find out what appliances were necessary and how to construct them, how to make them stand up to their work. They have been doing that year in and year out for the last 10 years. The natural gas country is now full of appliances for handling, measuring and controlling high pressure gas, that we do not appreciate at all because we, at low pressure, have had no occasion to look into the line of appliances that are on the market in the Pittsburg center, and in Indiana more particularly. There are governors there that will do practically any work you want them to. The house regulators are most perfect pieces of mechanism. The ones that we use we transplanted bodily from the natural gas people. We did not have to invent them or design them or work them out; we simply appropriated what had been worked out in the first place and "annexed" them. They cut down from 10 to 20 pounds of pressure on the one side to 17 tenths on the low side at one operation. There is not a variation of 1 tenth of an inch, whether one burner be turned on or 50 burners. Pittsburg is full of them. I may say that the majority of the Welsbach business is done in Pittsburg from natural gas at a few pounds pressure in the street through one of these governors to 17 tenths pressure inside of houses. That is the standard pressure at which the regulators are set at the meter, and they work perfectly. Probably there are thousands and thousands of those regulators in use in the cellars at Pittsburg, and they have no more trouble from them than from an ordinary cock or any other standard piece of mechanism. They do not begin to have the trouble they do with meters. They do not get out of adjustment as easily; they do not have the repair expense that meters have. They are so constructed that if anything goes wrong the pressure is not thrown on the meter and on the house pipes. They differ in their different makes as to their design and action on this point. Some of them go to the point that if anything goes wrong, any excess gas passes through a pipe out into the open. In any possible event of gas getting by the diaphragm or by the governor it will not get into the cellar or the building, but goes back into the atmosphere, through a $\frac{3}{8}$ pipe from a vent in the top of the governor back through the hole in the wall that the service pipe comes in, only a distance of 3 or 4 feet. It is so easily covered that one pattern of governor has rather taken that up as its way of meeting any possible objection on that score. My feeling is that if Pittsburg and Indianapolis and Muncie, and all the other natural gas towns in the West, can use these devices by the thousand, not only scores and hundreds, but thousands and probably scores of thousands, between the nearest and the farthest confines of the natural gas region, they can be used with equal safety in handling an artificial gas, if we should see fit to pump up the pressure of that to a few pounds instead of a few ounces. I do not think we are taking any material risk in using such appliances. The demonstration has been made on natural gas. We are simply copying and doing what has been done for years there. On the question of contraction and expansion, that Mr. McKay asks about, I would rather tell him outside just how we covered that point. The sockets were special, in the sense that they brought the pipe ends butt to butt and had more of a taper than the ordinary socket, so that when the threads were made up with chain tongs, with a piece of pipe stuck over them and three men pulling on it, there was very little question but that those sockets were tight—much more likely to be tight than the ordinary socket. In answer to the inquiry as to trouble at the governor, I stated, I think, most clearly in my paper, and I cannot make it any more complete, that the governors have been simply perfect. We have not had any suggestion of trouble. They were put in, set, regulated a little bit as we thought about right, started right, and have been operating the same way ever since. We have adjusted them a few times up and down, in experimenting as to pressures locally, but as far as their record is concerned it is perfect. As to the drip found at those governors: We take out of the governors a little lubricating oil that is put in them, and nothing else. The drip (the condensation from compressing the gas) is caught at the beginning of the pipe line, and does not deposit out along the pipe line. We made provision for drips at every low point. There was a little delay in getting them, and, as a matter of fact, we only put in drips on the first 3,000 feet. Openings are left on the balance of the 4 miles of pipe, but there are no drips. We find that all the condensation due to compression is caught around the pump and at the first drips, a few hundred feet out on the line. In opening a pipe to make a connection to the county almshouse, midway in the line, after a month or six weeks' operation the pipe was as dry

as a bone; no evidence of moisture, and that was at a low point. There is no evidence of moisture at any place throughout the line, beyond the initial drips that I spoke of. We find no "refrigeration" at the governors. In theory there should be such—probably it is there if we should endeavor to determine it exactly, but there has not been enough to be particularly noticeable, certainly not enough to bother us in any way, and we have substantially ignored any cooling that comes to the gas from the expansion. The rate of expansion is comparatively moderate, and there is more or less metal work about, and I presume the cold is absorbed in such a way that it is not particularly in evidence. In regard to the distribution of natural gas under pressure in the Western towns that Mr. Learned asked about, I have not posted myself particularly as to exactly the conditions, but I am under the very strong impression (and perhaps some of the members who have recently been West—I am looking at Mr. Ramsdell just now—and have traveled in that region more or less, may be able to correct me or to advise) that the natural gas is brought, of course, across country, ordinarily speaking, at 100 or 200 pounds pressure, whatever it may be, and then that city ordinances compel in most cases its reduction at the city limits to what is called a low pressure service, which low pressure is, I believe, from 5 to 7 or 10 pounds, along in that range. If that is so, and I believe it is so (I know it is in some cities), then the natural gas people are distributing in wrought iron pipes (that Mr. Prichard asked the propriety of) an explosive, inflammable substance, *i.e.*, gas, under a number of pounds pressure, and a gas which has but comparatively little odor, if any, in the event of leakage. That is all that I propose to do in distributing illuminating gas at a few pounds pressure, 5, 10, 15, 20, or along in that range; and I think we would find in doing it that we would be taking no more material risk than the natural gas people to-day are safely doing in hundreds of cities, in the States commencing with Pennsylvania and westward. If they can put in wrought iron pipes over and under and around and about sewers and water pipes, conduits, trolley systems and anything else that is found in the principal cities, and if they, as in Buffalo and Pittsburg, Allegheny, Columbus, Detroit, Indianapolis and every principal city that you can think of almost in the middle West, can safely distribute an explosive, inflammable stuff through wrought iron pipes, as they do, without enough trouble or accident or "come-backs" to make a hue or cry or furore, but do it daily with ordinary success and general satisfaction on their own part, and the part of the public as well, we certainly are not doing anything involving any *more* risk, in my judgment, in doing exactly the same thing with artificial gas instead of natural gas. My belief is that the whole thing resolves down to simply the proposition: "*Why cannot we do with artificial gas exactly what is being done with natural gas, and has been done with natural gas safely and satisfactorily, for quite a number of years?*" Can we not do that, and do it at very much less expense than we are now delivering our product? It seems to me there is room for a heap of cogitation on that point. It is what I think we are gradually demonstrating with this little plant at Royersford, Pa., and which will be further demonstrated probably this coming season, by two other installations of that nature. We have used a gasholder there for the present because we had it. It was not necessary to take any more risk with a new plan of working than we had to take. The holder was there. We connected it up; but a short time ago we cut it off and bypassed it to see how the town would behave without it. There was no difference in the results at all. There was no logical reason why there should be any difference. The governors do not care, so to speak, whether they are working against a holder or against a town—they are simply throttling a certain pressure; and if they will dependably do that one does not need a holder, in my judgment. I believe that provision should be made for the duplication of those governors, for cleaning, for getting out of repair. No piece of machinery can be depended upon to work forever, or without needing attention some time. Fortunately, however, for high pressure installations, both the pumping mechanism and the reducing mechanism at the far end are exceedingly cheap in relation to the work that they do. You get a governor for $100 or $150. You can duplicate that governor and have the two side by side in the same box at a trifling expense. The interest on that additional investment is practically nothing a year. In doing that one has perfect provision for attending to one governor, cleaning it, or repairing it, if it gets out of order, and by the use of such governors, first one week and then the other, the two alternating, one positively knows that the mechanism at all times is in working order. The same applies to the compressor. With duplicate compressors the pressure in a pipe line will carry itself for a few minutes, half an hour or an hour perhaps, before the public get out of gas, because of the gas stored in the line. Well, within that time, within a minute's time in the event of accident, one could easily start up the other compressor. The Pintsch people do that in several places where they supply a railroad service, where the complaint in the event of shut-down is quite as emphatic as any complaint that we are likely to receive. They never stop delivering from one year's end to the other. If they can do it we can do it.

The President—Gentlemen, as I understand the rules of the Association, after a discussion is closed and reply is made it is not usual to call on anyone else. Mr. Shelton, however, has mentioned Mr. Ramsdell's name, and I am sure we will be glad, if Mr. Ramsdell cares to say anything, to hear from him, of course with the provision that Mr. Shelton has a reply if he wishes it. Mr. Ramsdell, do you care to say anything?

Mr. Ramsdell—I might possibly give some information regarding the question asked about natural gas, having had some experience in two towns in competition with companies that distributed natural gas where our company owned plants. My general impression is that in former times the natural gas companies were very indifferent to governors or other things of that sort. Their pipes were probably laid in haste, and the full pressure of the wells was put on the pipe up to the time that it reached the community which it was to serve. As a factor of safety, however, the communities supplied resorted to ordinances which compelled the natural gas people to reduce their pressure to what was considered a safe limit. I think this pressure is usually 5 pounds, and in a great many instances the pressure in the house was at that figure, but the friction in pipes through the towns as a rule reduced it so that probably about 2 pounds would be the average in the houses. They found a great deal of difficulty in using Welsbach lamps under this pressure, and, as most of you know, the Welsbach Company got out a special mantle, which was called the natural gas mantle. I do not remember its number, but it never gave as good a light as did the Welsbach No. 169 until somebody out in that territory was shrewd enough to invent a little governor, placed on the burner underneath the mantle, which ended all of that trouble. So that they can now use the No. 169 just as we do, and you can scarcely tell one from the other. Recently the natural gas companies themselves have had to resort to all sorts of plans and schemes to retain their gas themselves, in order to give a sufficient supply for the demand, so that they have gotten up all of these forms of apparatus of which Mr. Shelton speaks. They have very perfect governor systems, and everything is now done possible to keep up their supply. They have great difficulty, of course, in midwinter, so that it is necessary for them to do this. In fact, they now go so far as to meter the gas in a great part of that country, where formerly they did not do anything in that line. As to the use of holders, I think such impression arises from the fact that one of the principal natural gas companies in the west has within recent years purchased a good many illuminating gas plants, and in such instances they are generally accused of putting their natural gas in holders, enriching it and selling it in our way. I don't think they do this. I don't think they use holders at all. They simply depend on the pressure from the wells for their supply.

Mr. Harbison moved (seconded by Mr. McGregor) a vote of thanks to Mr. Shelton. In announcing the result, the President said: Mr. Shelton, it gives me great pleasure to give you the thanks of the Association for this paper. We are very much indebted to you for bringing before us a new subject, and we hope that further experience will bring forth another paper in which you can answer certain questions. We thank you, sir.

[To be Continued.]

The Value of Producer Gas as a Fuel.[1]

The question, What theoretical loss of heating power does coal suffer when burned indirectly as "producer" gas? is one which has already been dealt with by some authorities; but the inquiry is not exhausted. The idea current in the minds of many who give some thought to the subject is that indirect burning of this kind causes a loss of something like one-third of the heating power of the coal. Such an idea is likely to have arisen in this way: Carbon burnt to carbonic oxide—the most important component of producer gas—parts in the burning with 30 per cent. of its full heating power; and as carbon is the chief constituent of coal, the loss in the case of the one body has evidently been placed over against the other. Coal, however, is far from being all carbon. Moreover, the carbon of coal is of two kinds—volatile and fixed. Each kind behaves in its own way inside the producer. The carbon that is fixed is the only carbon to suffer loss of heating power

1. From the *Iron and Coal Trades Review*, England.

by the burning inside the producer. The volatile carbon suffers no loss of heating power. It becomes rather the absorbent of much of the heating power the other carbon loses.

To make this plain it is necessary to bear in mind certain facts relating to coal and its combustion. The burning of coal is both a heat giving and a heat absorbing operation; and this is so, no matter how the coal is burned, whether a producer be used or not. Before the first appearance of flame can kindle on a piece of ordinary coal, heat must have been absorbed and work done upon that piece. This work is the liberation of gas and vapor out of its solid mass. The change in volume which takes place on the gas and vapor substance so liberated is very great. A single cubic foot of coal may yield several hundreds of cubic feet of gas and vapor, and this, too, while the coal to outward appearance is suffering no diminution of its own bulk. Such a change in volume in any body has a close connection as to amount with the amount of the heat which must disappear in working the change. Thus a cubic inch of boiling water in becoming a cubic foot of steam works up, or causes to disappear, heat sufficient to make boiling hot other 6 cubic inches of cold water. Of the whole substance of the coal there is usually about one-third (in many cases a good deal more) over which there passes this great change in volume. From this it will be seen that heat absorption on a scale too great to be overlooked has to be reckoned with in the combustion of a lump of coal.

Of the particular form of combustion which takes place inside the producer, it is necessary also to say something. The only combustion there which need take place is that of the fixed carbon of the coal burning to carbonic oxide. The carbon by this burning becomes dissolved away from its solid form into a fluid combustible gas until only its incombustible ashes remain. This burning produces a definite quantity of heat, and out of the sum of that heat is supplied whatever part may be necessary to drive out all the vapor and gas referred to above. But this sum of heat has to be drawn upon to supply heat for work of another kind as well. The air which burns the carbon to carbonic oxide is, of course, ordinary atmospheric air. Atmospheric air carries with it a small proportion of water vapor, variable in amount, but never entirely absent. This water vapor becomes decomposed in its passage through the red-hot carbon in the lower part of the producer, and there results from this decomposition another enlargement in volume compensated for by a further absorption of heat. The supply of this heat is another drain upon the heat which results from the burning of the fixed carbon to carbonic oxide, but a drain which means in this case no permanent loss.

Heat, then, being absorbed to a considerable extent in any burning of coal, and that amount of heat which is generated within the producer being only the fraction of a fraction, it would appear to be possible to have a balance established between the heat produced and the heat absorbed inside the producer.

This matter, so important, is one which fortunately can be brought to the test of figures—approximately so tested, at least. Before the figures are brought in, it may be explained that one of the chief factors of the calculation to be entered upon—the proportion of heat absorbed in driving out a given weight of gas and vapor from coal—has not as yet had an exact value assigned to it. The value which will be given to it here is the same as that attributed to it by Sir Lowthian Bell in his work on the "Principles of the Manufacture of Iron and Steel." In that work, calculations have been made of heat absorption of this kind in coke making, and also in iron smelting where raw coal is the fuel. A second doubtful factor of the calculation is the amount of heat produced by the burning of mixed hydrocarbons. A value not likely to be far wrong has been taken for this—a value based upon the findings of the chief authorities. But any error on this head can have very little effect upon the conclusions drawn.

Returning, then, to the main question of the effect on heating power in using the gas producer, it would appear that the nature of the coal must have consideration. Lanarkshire splint coal might be taken in the first place as possibly a fair representation of the common or manufacturing coals of Scotland. The composition of this coal is given in Bell's work referred to above as the following:

	Per Cent.		
Water given off at 212° F.	11.62		
Carbon	66.00	—fixed 53.41 and volatile	12.59
Hydrogen	4.34	total	16.37
Oxygen	11.09		
Nitrogen	0.94		
Sulphur	0.59		
Ash	5.42		
	100.00	Total gaseous constituents	28.96

This coal, if burned in an open fire grate in the usual direct fashion, would give something like the following value in heating power:

	Heat Units.
Carbon (fixed), 53.41 × 8,000	= 427,280
Hydrocarbons (carbon, 12.59; available hydrogen, 2.96), 15.55 × 12,000	= 186,600
Together	613,880

But this heat is not all available. Deduction, as explained, has to be made therefrom for—

	Heat Units.
Evaporation of water in coal, 11.62 × 622 (537+85)	= 7,227
Expelling gaseous matters in coal, 28.96 × 2,000 (Bell)	= 57,920
Together	65,147

The net heating power works out therefore to 613,880 — 65,147 = 548,733 heat units.

Comparing this result with the heating power of the producer gas from the same coal, the gas being burnt cold, the figures are:

	Heat Units.
Carbon, 53.41 = carbonic oxide, 124.62 × 2400	= 299,088
Hydrocarbons (same as above), 15.55 × 12,000	= 186,600
Hydrogen derived from moisture of blast, 0.288 × 28,600	= 8,236
Total heating power of gas	493,924

The difference between these two sums, 548,733 and 493,924, is 54,809, which means that 9.98 per cent. of the heating power of the coal would be lost by burning it as producer gas.

Coal might be taken next, where the composition is more than of the average of the coals of the whole United Kingdom. To such coal it might not be far wrong to give a composition of fixed carbon, 60 per cent.; volatile matters, 30 per cent., whereof 20 per cent. are combustible; and moisture and ash, 10 per cent. (moisture 5 and ash 5).

This coal, burned directly in the ordinary fire grate, would give probably the following value in heating power:

Carbon (fixed)	60 × 8,000 = 480,000	heat units.
Hydrocarbons	20 × 12,000 = 240,000	"
Together	720,000	heat units.

Deduct now—

Evaporation of moisture	5 × 622 = 3,110	heat units.
Expelling volatile matters	30 × 2,000 = 60,000	"
Together	63,110	heat units.
Net heating power	720,000 — 63,110 = 656,890	heat units.

Converted into producer gas, and this gas burnt when cold, the result in heating power from this same coal would be—

Carbon 60 = carbonic oxide	140 × 2,400 = 336,000	heat units.
Hydrocarbons	20 × 12,000 = 240,000	"
Hydrogen derived from moisture of blast	0.324 × 28,600 = 9,266	
Total available heating power of gas	585,266	
656,890 — 585,266	= 71,624	heat units of loss.

The loss per cent. of heating power in burning this coal as producer gas would be 10.9.

As the fixed carbon of a coal increases, it will be seen this calculation makes the proportion of loss by indirect burning to increase likewise. Again, with a coal containing very low fixed carbon—say, down to about 40 per cent., and volatile matters coming up to about 50 per cent.—the calculation would show no loss whatever for conversion to producer gas. Not many ordinary coals are found in this country where the ratio of fixed carbon to volatile matters is so low as 4 : 5; but even a much lower proportion of fixed carbon to volatile matters than this is found among the carbonaceous shales of the coal measures.

If anthracite coal be taken as representing the very highest ratio of fixed carbon to volatile matters in the whole of the coal family, the carbonaceous shales might be taken as the representatives of the other end of the scale. Anthracite may have nine or ten parts of fixed carbon for a single part of volatile matter; the shales a single part of fixed carbon to five or six parts of volatile matter. Anthracite as a fuel for making producer gas, when tried by the calculations used above, might show a loss in heating power as high as 25 per cent., or even fully more. The shales tried in the same way could not show any loss. Mixed with ordinary coal in a producer, the shales might even become the useful absorbents of surplus heat taken by the producer out of the

coal, and thus make the gas-making process theoretically perfect so far as the heat equation is concerned.

The conclusion this points to is favorable to the use of the gas-producer. Previous calculations do not appear to have taken account of the heat-absorption side of the question. It is difficult, however, to see how this can be disregarded in reasoning upon either the theory or the practice of the matter. Carbonic acid in the shape of gas, and water in the shape of vapor, become discharged as the ultimate products of burnt-out fuel in all the forms of burning; and the latent heat of a vastly increased bulk must with these be carried off with no chance of recovery.

The correction in these calculations which has to do with moisture in the air that burns the carbon to carbonic oxide is based upon the average amount of such moisture in the air of this country. No allowance is made here for steam additions such as are common in the generation of producer gas. Steam, no doubt, can be used with advantage to store up the surplus heat of the producer, just as the natural moisture of the air is seen to store it up; but to generate steam requires heat. Besides, there seems likely to be a difficulty in using it exactly in the quantity required if carbonic acid is to be kept down in the gas.

The heat which hydrogen is assumed to absorb for its decomposition, and afterwards to give out again in burning, is not the full heat value of hydrogen burnt to water. The latent heat of the vapor is deducted. This latent heat comes with the air, and departs again with the products of combustion.

It has been proposed, for the sake of certain advantages, to melt out as a liquid slag the incombustible ashes of the fuels used in producer, gas making. This operation would absorb heat not absorbed in ordinary burning. Any solid body in becoming a liquid body absorbs heat for the work spent in making the change. The amount of this heat appears to be affected very much by the nature of the body itself. The cinders or slags of iron smelting blast furnaces appear to be the only substances of a similar nature which have had their latent heat of fusion determined. Authorities differ in the value they give for the fusion of these. The value taken by Sir Lowthian Bell is 550 units. Assuming this to be correct, as applied to the earthy matters of coal, then for each 5 per cent. of these matters in the coal the absorption for latent heat of fusion would be 2.750 units, or less than ½ per cent. of the full heating power of the coal. Heat for this work would be drawn, as in the other cases, from the producer combustion—that is, from the carbon there burning to carbonic oxide, and the work would be done with no lessening whatever of the heat potential in the producer gas.

The sum of all the foregoing would seem to be:

1. That in making producer gas with coal of average quality, the loss in heating power need not be much over 10 per cent.

2. That this 10 per cent. of loss might be wiped out by certain changes in the fuel.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

The proprietors of the Logan Iron Works, of Brooklyn, N. Y., were recently awarded a contract for five large self-supporting smokestacks, to be erected in the Sandwich Islands. The stacks are to be 150 feet in height, and taper from 19 feet diameter at the base to 12½ feet diameter at the top. The Messrs. Logan have also been awarded the contract for a holder, and for purifiers, washer, condenser and the necessary connections, etc., for Albany, N. Y.

Mr. Allen Shewmon, of Racine, Wis., does not agree with the Journal, in the suggestion that a gas works for Great Fall, Montana, would be an unprofitable enterprise. In fact, in a letter addressed to us under date of February 20th, in which he refers to our mention (issue of February 19th) of the Great Falls projected gas works. He says, among other things, "Strange as it may seem, I had persuaded myself that Great Falls was a good point to install a gas works." Evidently Mr. Shewmon means to go ahead with the Great Falls works, and no one will be better pleased than the Journal to know in the end that Mr. Shewmon's judgment was right, respecting the particular matter under consideration.

Mr. Allan C. McGarth, for many years Superintendent of the Chambersburg (Pa.) Gas Company, died at his home in Chambersburg the evening of the 10th ult. He was born in Philadelphia in 1834, and went to Chambersburg in 1856 to assist in the construction of the gas plant for that town. On the completion of the plant he was retained as its Superintendent. He served during the Rebellion with distinction as a member of the 126th Pennsylvania Regiment. He was prominent in G. A. R. affairs, and was also noted for his devotion to Masonic principles and practice.

Messrs. Watson, Diehl & Kemmerer, Solicitors of Scranton, Pa., have given notice that an application will be made to the Governor of Pennsylvania, on March 13, by Messrs. Liddon Flick, Harry T. Hyndman, Otis Lincoln, W. L. Watson and W. W. Watson, under the Act of Assembly entitled, "An Act to provide for the incorporation and regulation of certain Corporations," approved April 29, 1874, and the supplements thereto for an intended Corporation to be called Consumers' Gas Company of Northampton County, the character and object of which will be "the manufacture and supply of gas for light only to the public in the townships of Lehigh and Allen, in the County of Northampton, State of Pennsylvania, and to such persons, partnerships and Corporations residing therein or adjacent thereto as may desire the same, and for these purposes to have, possess and enjoy all the rights, benefits and privileges of the said Act of Assembly and supplements thereto."

Colonel J. W. R. Cline, for many years the successful Manager and Superintendent of the Springfield (Ohio) Gas Company, has resigned from its service to accept the place of General Manager of the consolidated gas interests at Covington and Newport, Ky. Of course, this must be a promotion, and we congratulate the Colonel on his advancement, but we will nevertheless venture the prediction that many will agree with us in the thought that he was a fixture, or part and parcel of the Springfield Company. The best of good luck to him.

Mr. W. H. King has resigned the position of official gas inspector for the city of Cleveland, Ohio.

Attention is called to the special advertisement of the Berlin Iron Bridge Company, of East Berlin, Conn., which appears in our advertising pages. The Company announces that it has a very large stock of structural material, consisting of beams, channels, angles, etc., in stock at East Berlin, and consequently is able to furnish, in very short time, steel bridges, buildings, roof trusses, etc. As this class of material is very difficult to obtain at the present time, it may be of interest to those of our readers who contemplate additions to their plants to communicate with the Berlin Iron Bridge Company.

At the annual meeting of the Spokane Falls (Wash.) Gas Light Company, the balance sheet submitted by the Company's methodical and in every sense competent Secretary (Mr. W. A. Aldrich) was most satisfactory to the stockholders, in that it showed a substantial revenue over all, fixed charges included. Accompanying the balance sheet was the annual report, the main points of which are reprinted—the report covers the period for the twelvemonth ended December 31st, 1899:

"The year just closed has been a satisfactory one for the Company, and I take pleasure in presenting the following comparative figures:

"Gas receipts for 1895, $22,615.37; for 1896, $28,050.96; for 1897, $34,440 90; for 1898, $40,420.79; for 1899, $47,293 25. Showing an increase of 109 per cent. over the year 1895.

"Gas made, 1895, 13,000,000 cubic feet, gas sold, 12,023,000 cubic feet; 1896, 14,000,000 cubic feet, gas sold, 13,035,000 cubic feet; 1897, 18,417,000 cubic feet, gas sold, 17,517,000 cubic feet; 1898, 23,841,000 cubic feet, gas sold, 22,073,000 cubic feet; 1899, 29,421,000 cubic feet, gas sold, 26,261,000 cubic feet. Showing an increase of 126 per cent. over the year 1895.

"The number of consumers' meters in use in 1895 was 934; in 1896, 1,088; in 1897, 1,311; in 1898, 1,481; in 1899, 1,814. Showing an increase of 97½ per cent. over the year 1895.

"Examination of the above statistics will show that the increase in consumption is in greater ratio than the increase in consumers, which is a very satisfactory feature, and demonstrates the increasing use of gas for fuel. The growth of the stove business will be better understood by an examination of the undermentioned figures: Number of gas stoves in use, 1895, 435; 1896, 515; 1897, 597; 1898, 730; 1899, 950. Showing an increase of 95 per cent. over the year 1895. Special efforts were made during the past year to encourage the use of gas ranges, which will be seen by the great increase was eminently successful. The rapid growth of the Company's business has severely taxed the capacity of the plant. In order to keep up efficient service to our patrons and provide for the ever increasing business it has been necessary to increase the capacity of the plant, which has been done under the direction of the Superintendent, Mr. Hopper. The capacity is now about trebled, and no fears need be entertained for the future. It has been found expedient and necessary to increase the capital stock of the Company, in order to provide the requisite funds for enlargement of

works and extension of mains, which must be done this spring, if we are to keep up with the growth of the city and the increasing favor of our product. This has been done and the capital stock raised to $250,000. The plant and other property of the Company have been kept in a high state of efficiency. The details of such a growing business in the distribution department is no less extraordinary than interesting. I will make no comparisons with previous years, but merely quote a few facts and figures: Number of Welsbachs installed, 1899, 2,980; number of mantles installed, 6,652; number of orders received at the order desk, 6,064.

"The item of expense for 1899 is much heavier than for previous years. Electrolysis has been making great ravages in the Company's main system, so much so that it became absolutely necessary, in order to protect our property from destruction, to take action to compel the Street Railway Company to take measures to prevent stray currents from their rails doing irreparable injury to our mains and services. An injunction was applied for, and, after a 10 days' trial, judgment was given in our favor and the injunction prayed for granted. The Street Railway Company appealed to the Supreme Court, and we confidently expect that the judgment of the Superior Court will be sustained, in which case the Company will have to adopt the double trolley system.

"During the past year we have been considerably hampered by labor troubles. First, we were boycotted because we would not allow our men to join the union. The men were so intimidated that they left their employment, saying they were afraid to work longer. We then consented to them joining the union, which meant an increase of 30 per cent. in their wages. Our experience with union men is very much in favor of the non union man. After awhile the union men demanded that our Welsbach men, who stood by us during the boycott and refused to quit, should be discharged and union men put in their places. Our answer was to increase the wages of these men. We discharged every union man in the place, and informed them that for the future union men would not be employed. I am pleased to report that we have no more trouble with them."

At the annual meeting of the Gas Company of West Chester, Pa., the officers chosen were: Directors, Charles Y. Audenried, D. S. Lindsay, H. V. Massey, George Henderson and Robert Wetherill; President, D. S. Lindsay; Treasurer and Secretary, George Henderson. It was also decided to enter into a contract with the United Gas Improvement Company under which the output capacity will be doubled.

The Philadelphia Surburban Gas Company proposes to extend its main system through the borough of Glenolden, the necessary consent from the authorities in the premises having been obtained.

Advices from Baltimore, Md., are to the effect that the Isabella Gas Works, of Frederick, Md., have been subleased to Mr. Marcus R. Williams, of Baltimore, by the present lessee, Mr. Joseph B. Hope, of Philadelphia. The plant is to be remodeled.

The gross selling rate for gas, by the Winnipeg (Manitoba) Electric Street Railway Company, which concern controls the gas and electric lighting supply of Winnipeg, has been put at $2.25 per 1,000 cubic feet—a concession of 25 cents per 1,000. Prompt payment entitles the user to a rebate of 10 per cent.

Assemblyman Ahern, of Troy, N. Y., is responsible for a bill in the New York Legislature, the second section of which reads: "No corporation, association, company, co-partnership or person shall charge or receive for illuminating or fuel gas furnished or supplied to the inhabitants of the city of Troy a greater rate than $1 per 1,000 cubic feet."

The authorities of Salinas, Cal., have ordered that the gross selling rate for gas in that city shall not exceed $2.50 per 1,000 cubic feet.

It is now said that Dr. John N. Goltra, of Fort Brady, Mich., has been awarded the franchise for the construction and operation of a gas works at Sault Ste. Marie, Mich. There have been many surprising shifts so far in connection with this privilege.

We regret to learn that Mr. Edward C. Lee, Treasurer of the United Gas Improvement Company, whose responsible and zealous work with the Company covered a period of something over 18 years, has resigned. His resignation was accepted last Wednesday.

Mr. Thomas Wood, at one time Secretary of the York (Pa.) Gas Company, died in York the morning of February 22d. Deceased, who was in his 77th year, was born in England, and settled in York about 32 years ago.

The proprietors of the Winsted Gas Company, of West Winsted, Conn., have purchased important water rights at Robertsville, Conn., with a view to extending their supply of electric currents for power purposes in Winsted and its surroundings.

The deal recently completed at Newburg, N. Y., means that the gas and electrtc lighting supply of that city will hereafter be operated in complete harmony, with the interests that controlled the gas situation likely as the persuasive factors.

Mr. W. C. Reid has been appointed Superintendent of the Anniston (Ala.) Electric and Gas Company, vice Mr. M. T. Walker, who, as said in a former issue, has accepted the post of Superintendent to the Rockville (Conn.) Gas and Electric Company.

The Bay City (Mich.) plant was turned over to its purchasers (who were represented by Messrs. Bertron & Storrs, of New York), the 1st inst.

The proprietors of the Hempstead (L. I.) Gas Light Company are seeking an extension of their franchise.

The properties of the Seneca Falls and Waterloo (N. Y.) Gas Light Company have been purchased by Mr. Wm. T. Morris, of Penn Yan, N. Y., and his associates.

The Laclede Firebrick Manufacturing Company, of St. Louis, Mo., has been awarded the contract for the renewing of the benches on the municipal gas plant at Hamilton, Ohio.

Messrs Baxter & Young, of Detroit, Mich., are at the head of the syndicate which has purchased the properties of the Conneaut (Ohio) Gas, Light and Fuel Company, a concern that formerly supplied natural gas in Conneaut. They propose to construct a works on coal gas lines, and will be ready to supply artificial gas to the district by July 1st. No change will be made in the title of the Company, and its officers are: Directors, Isaac C. Baxter, E. A. Miller, Peter Young, John McMillan and S. J. Smith; President, Isaac C. Baxter; Vice-President, E. A. Miller; Secretary and Treasurer, Peter Young; Superintendent, F. M. Olmsted. Conneaut is the point where the iron ore from the Escanaba region can be most easily taken to the Carnegie works for instance, and it looks to have a great future.

The following circular was issued last month to the people of Cincinnati, Ohio, by the proprietors of the Cincinnati Gas Light & Coke Company:

Office of the Cincinnati Gas Light and Coke Co.,
Cincinnati, February 12, 1900.

To the Users of Light, City of Cincinnati: The Cincinnati Gas Light and Coke Company, and its allied interest, have under charge, and are efficiently operating, three of the finest, most complete and best equipped electric light stations in this country. All these stations are now connected by trunk lines, in order that any accident or impairment of service at one station may be instantly remedied by supplying current from either of the others. We are thus not only prepared to give the best possible electrical service, but of a character that is absolutely free from the frequent annoying interruptions in service due to station accidents where the supplying company has but one source of supply. This perfect service we are now prepared to supply at the same figures charged by companies having but a single station. We realize, however, that it is light which is desired, of a constant, unvarying and fixed character, at the lowest possible price, and it matters little to the consumer through what instrumentality it is obtained. With that spirit of frankness and candor which has ever marked our intercourse with the Cincinnati public, it appears proper that it should be truthfully and intelligently advised of the relative cost of supplying equivalent illumination by gas and electrical service. The alleged candle power of an incandescent electric lamp, when new and in the best possible condition, is rated at 16-candle power. A Welsbach gas burner of the most approved type will show, by actual photometric test, 100 candle power. And we are at any time prepared to show a burner of this character—the "Kern"—about to be introduced, which gives 125 candle power, with a consumption of only 4 cubic feet of gas per hour, and therefore showing eight times the lighting efficiency of the best electric lamp now in use.

By the published scale of rates, charges by all the electric companies in this city are ten (10) cents for each 1,000 watt hours, as shown by the meter or meters installed by the Company. From this rate discounts will be allowed for quantity consumed per 16 candle power lamp, as follows:

On a consumption per 16-candle power incandescent lamp of 2,000 to 3,000 watt hours in one month, 5 per cent.

On a consumption per 16-candle power incandescent lamp of 3,000 to 4,000 watt hours in one month, 10 per cent.

On a consumption per 16-candle power incandescent lamp of 4,000 to 5,000 watt hours in one month, 15 per cent.

On a consumption per 16 candle power incandescent lamp of 5,000 to 6,000 watt hours in one month, 20 per cent.

On a consumption per 16-candle power incandescent lamp of 6,000 to 7,000 watt hours in one month, 25 per cent.

On a consumption per 16-candle power incandescent lamp of 7,000 to 8,000 watt hours in one month, 30 per cent.

On a consumption per 16 candle power incandescent lamp of 8,000 to 9,000 watt hours in one month, 35 per cent.

On a consumption per 16 candle power incandescent lamp of over 9,000 watt hours in one month, 40 per cent.

These contract rates are based on watt hours, and being, therefore, somewhat obscure to most customers, we submit, for their benefit, the following net costs of lightng service:

Hours of Daily Use, 26 Days per Month.	16-Candle Power Incandescent, per Month.
1 hour	13 cents.
2 hours	24 "
3 "	35 "
4 "	42 "
5 "	49 "
6 "	52 "
7 "	55 "
8 "	62 "
9 "	70 "
10 "	78 "

(*Continued on page* 374.)

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 32 Pine Street, New York.

The JOURNAL is the official organ of the
NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.
AMERICAN GAS LIGHT ASSOCIATION.
WESTERN GAS ASSOCIATION.
OHIO GAS LIGHT ASSOCIATION.
PACIFIC COAST GAS ASSOCIATION.

TERMS:
SUBSCRIPTION—Three Dollars per annum, in advance. Single copies, 10 Cents.

Notification Respecting Advertising.—Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:
New York—American News Co. 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, MAR. 5, 1900.

(*Continued from page 373.*)

It may be clearly seen that for all ordinary electric service, say, 3 hours per night, for 26 days, each incandescent electric lamp costs 35 cents for (16x3x26) 1,248 candle power. A Welsbach incandescent burner of 125-candle power, consuming but 4 cubic feet of gas per hour, will give the same volume of light in a fraction less than 10 hours (1,248—125 9.98-100) with a gas consumption of (9.98x4) 39.92-100 cubic feet of gas, which, at 75 cents per 1,000, costs but 3 cents, or substantially but one twelfth the cost of an equal degree of illumination afforded by an incandescent electric lamp. These are startling, yet absolutely truthful, comparisons of the relative cost of producing the same volume of light. There is not another city in the United States where lighting service costs so little. And the Cincinnati Gas Light and Coke Company, with its allied electrical companies—the Cincinnati, the Brush, the First Edison and the Hauss—have adopted every improved appliance, both for electricity and gas, which skill can devise or money can purchase, in order to give a positive guarantee of future service better than any heretofore enjoyed by the users of light in Cincinnati.

The Market for Gas Securities.

There wasn't any market for city gas shares to-day (Friday), the situation being entirely with the bears in all divisions of the stock trading. Consolidated closed last night at 183 bid; the first sale this morning was at 181; the low point was 176½, and the closing was 178 to 179. So it was with other gas shares. All went down with a rush, which shrinkage may not be accounted for on the ground that the properties are worth a cent less than they were a week ago. In fact, everything points just now towards the belief that the city gas magnates are almost sick of the "fight." The New Amsterdam Company has issued some more treasury bonds—what matters a few more or less?

Brooklyn Union holds up fairly well, but it is many points below its real worth. Peoples, of Chicago, was smashed by the bears, who persistently declared that there was likelihood of sharp competition in Chicago's gas trade. We do not believe the "war" will be a fatal one. Baltimore Consolidated showed weakness, on the passage in the Maryland Senate of the bill to put the selling rate at $1 per 1,000. The measure has still to run the gauntlet of the House and the Governor. Bay State is, as one of our visitors recently said, "the steadiest stock on the list." Its price, however, is not high. All city gas shares seem very cheap at the quoted prices.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

MAR. 5.

☞ All communications will receive particular attention

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$39,078,000	100	178	179
Central Union, Bonds, 5's.	3,000,000	1,000	103½	105
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	115	118
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	275	300
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	
New Amsterdam Gas Co.	13,000,000	100	24	26
Preferred	10,000,000	100	45	46
Bonds, 5's	11,000,000	1,000	95¾	96¼
Northern Union, Bonds, 5's.	1,250,000	1,000	95	97
New York and East River.. Bonds 1st 5's	3,500,000	1,000	109	111
" 1st Con. 5's	1,500,000	..	115	..
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	115	120
Preferred	5,000,000	100	138	145
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	114
Yonkers	299,65	500	130	.
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	145	146
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	1¼	1⅝
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	40	..
" 1st Mtg. 5's	475,000	1,000	96½	99½
Boston United Gas Co.— 1s Series S. F. Trust	7,000,000	1,000	92	..
2d " " "	3,000,000	1,000	68	..
Buffalo City Gas Co.	5,500,000	100	5	8
" " Bonds, 5's	5,250,000	1,000	69	71
Central, San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,207,000	1,000		108
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	60	65
Preferred	3,026,500	100	84	86
Consumers, Jersey City Bonds	600,000	1,000	102	105
Cincinnati G. & C. Co.	8,500,000	100	193½	194½
Consumers, Toronto	1,700,000	50	230	235
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	11,000,000	100	55	55¼
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	21	23
" Con. Mtg. 5's	380,000	1,000	87	90
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,560,000	50	95¾	96
" Prior Lien 5's	4,598,000	1,000	99½	100
Detroit Gas Co., 5's	386,000	1,000	100	101
" Inc. 5's	16,000	100	100½	101
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	35	41
" Bonds	2,000,000	..	60	64
Grand Rapids Gas Lt. Co.	1,000,000	50	..	..
" 1st Mtg. 5's	1,125,000	1,000	..	..
Hartford	750,000	25	..	220
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	102	105
Indianapolis	2,000,000	..	100	105
" Bonds, 6's	2 650,000	..	101	103
Jackson Gas Co	250,000	50	72	78
" 1st Mtg. 5's	250,000	1,000	101	102½
Lafayette Gas Co., Ind.	1,000,000	100	40	45
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	106	
Laclede, St. Louis	7,500,000	100	76	77
Preferred	2,500,000	100	107	..
Bonds	10,000,000	1,000	110	110½
Madison Gas & Elec. Co.	400,000	100	82	..
" 1st Mtg. 6's	350,000	1,000	102½	108
Montreal, Canada	2,000,000	100	200	..
Newark, N. J., Gas Co.	16,000,000	..	50	60
Bonds, 6's	4,600,000	..	107	108
New Haven	1,000,000	25	280	300
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	43	45
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	95⅝	95¾
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	111⅝	111⅛x
2d "	2,500,000	1,000	104	105
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	49	50
St. Paul Gas Light Co.	1,500,000	100	57½	58½
1st Mortgage 6's	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,428,000	1,000	88	90½
St. Joseph Gas Co.	1,000,000	100	42	44
" 1st Mtg. 5's	750,000	1,000	96½	98
Syracuse, N. Y.	1,750,000	100	..	15
Bonds	1,612 000	1,000	85	90
Washington, D. C	2,600,000	20	268¾	270
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	100	106¾	107¾
Bonds, 5's	3,830,500	.	106	108
Wilmington, Del.	600,000		220	50

Advertisers' Index.

GAS ENGINEERS.

	Page
Wm. Henry White, New York City	395
Fred. Bredel, Milwaukee, Wis.	382
Geo. R. Rowland, New York City	393
The Western Gas Construction Co., Fort Wayne, Ind.	360
Humphreys & Glasgow, New York City	393
American Gas Co., Phila., Pa.	382
David Leavitt Hough, New York City	392
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	379
Baxter & Young, Detroit, Mich.	392
United Gas Improvement Co., Phila., Pa	387
James T. Lynn, Detroit, Mich.	392
A. E. Boardman, Brevard, N. C.	392

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd's Sons, New York City	396
Continental Iron Works, Brooklyn, N. Y.	394
Deily & Fowler, Phila., Pa.	396
Kerr Murray Mfg. Co., Fort Wayne, Ind	392
Stacey Mfg. Co., Cincinnati, Ohio.	395
Bartlett, Hayward & Co., Baltimore, Md.	393
Davis and Farnum Mfg. Co., Waltham, Mass.	392
R. D. Wood & Co., Phila., Pa.	394
Isbell-Porter Company, New York City	394
Fred. Bredel, Milwaukee, Wis.	382
United Gas Improvement Co., Phila., Pa.	387
National Gas and Water Co., Chicago, Ills.	389
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	379
The Western Gas Construction Co., Fort Wayne, Ind.	360
Humphreys & Glasgow, New York City	393
American Gas Co., Phila., Pa.	382
Logan Iron Works, Brooklyn, N. Y.	396
Riter-Conley Mfg. Co., Pittsburgh, Pa.	395
Baxter & Young, Detroit, Mich.	392
Berlin Iron Bridge Co., East Berlin, Conn.	381
G. Shepard Page's Sons, New York City	392
James T. Lynn, Detroit, Mich.	392
A. E. Boardman, Brevard, N. C.	392
Sutherland Construction & Improvement Co., N.Y. City	380
Chris. Cunningham & Son, Brooklyn, N.Y.	380

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md.	393
United Gas Improvement Co., Phila., Pa.	387
Burdett Loomis, Hartford, Conn.	394
National Gas and Water Co., Chicago, Ills.	389
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	379
The Western Gas Construction Co., Fort Wayne, Ind.	360
Humphreys & Glasgow, New York City	393
Sutherland Construction & Improvement Co., N.Y. City	380
B. E. Chollar, St. Louis, Mo.	384

SCRUBBERS AND CONDENSERS.

R. D. Wood & Co., Phila., Pa.	394
James R. Floyd's Sons, New York City	396
Continental Iron Works, Brooklyn, N. Y.	394
Logan Iron Works, Brooklyn, N. Y.	396
Riter-Conley Mfg. Co., Pittsburgh, Pa.	395

TAR AND CARBONIC ACID EXTRACTOR.

R. D. Wood & Co., Phila., Pa.	394

AMMONIA CONCENTRATORS.
Michigan Ammonia Works, Detroit, Mich..... 376
American Gas Company, Phila., Pa..... 382

GAS METERS.
John J. Griffin & Co., Phila., Pa..... 400
American Meter Co., New York and Philadelphia..... 399
Helme & McIlhenny, Phila., Pa..... 399
D. McDonald & Co., Albany, N.Y..... 397
Nathaniel Tufts Meter Co., Boston, Mass..... 398
Maryland Meter and Mfg. Co., Baltimore, Md..... 398
Metric Metal Co., Erie, Pa..... 399
Keystone Meter Co., Royersford, Pa..... 398
Detroit Meter Company, Detroit, Mich..... 399

PREPAYMENT METERS.
American Meter Co., New York and Philadelphia..... 399
John J. Griffin & Co., Phila., Pa..... 400
D. McDonald & Co., Albany, N. Y..... 397
Helme & McIlhenny, Phila., Pa..... 399
Nathaniel Tufts Meter Co., Boston, Mass..... 398

GAS AND WATER PIPES.
M. J. Drummond & Co., New York City..... 397
R. D. Wood & Co., Phila., Pa..... 394
Warren Foundry and Machine Co., New York City..... 397
Donaldson Iron Co., Emaus, Pa..... 397
Chris. Cunningham & Son, Brooklyn, N.Y..... 380
Cornell & Underhill, New York City..... 375

PIPE CUTTERS.
The Anderson Pipe Cutter Co., East Boston, Mass..... 376

GAS MAIN STOPPERS.
Safety Gas Main Stopper Co., N. Y. City..... 379

GAS TAPPING MACHINES.
George Light, Dayton, O..... 375

STEAM BLOWER FOR BURNING BREEZE.
H. E. Parson, Brooklyn, N. Y..... 389

GAS COALS.
Penn Gas Coal Co., Phila., Pa..... 391
Perkins & Co., New York City..... 390
Despard Gas Coal Co., Baltimore, Md..... 391
Westmoreland Coal Co., Phila., Pa..... 391
Berwind-White Coal Mining Co., New York and Phila... 390

CANNEL COALS.
Perkins & Co., New York City..... 390

CONVEYORS.
The Link-Belt Machinery Co., Chicago, Ills..... 379

GAS ENRICHERS.
Standard Oil Co., New York City..... 391
The Sun Oil Co., Pittsburgh, Pa..... 391

COKE CRUSHER.
C. M. Keller, Columbus, Ind..... 391

GAS GAUGES.
The Bristol Co., Waterbury, Conn..... 381

GAS GOVERNORS.
Connelly Iron Sponge and Governor Co., New York City 390
Isbell-Porter Co., New York City..... 394
R. D. Wood & Co., Phila., Pa..... 394
Wm M. Crane Co., New York City..... 378

CEMENTS.
C. L. Gerould, Galesburg, Ills..... 388

RETORTS AND FIREBRICKS.
J. H. Gautier & Co., Jersey City, N. J..... 388
Adam Weber, New York City..... 388
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 388
Cyrus Borgner, Phila., Pa..... 388
James Gardner, Jr., Pittsburgh, Pa..... 388
Henry Maurer & Son, New York City..... 388
Baltimore Retort and Firebrick Co., Baltimore, Md..... 388
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 388
Brooklyn Firebrick Works, Brooklyn, N. Y..... 388

REGENERATIVE FURNACES.
Bartlett, Hayward & Co., Baltimore, Md..... 393
Fred. Bredel, Milwaukee, Wis..... 382
J. H. Gautier & Co., Jersey City, N. J..... 388
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 388
Adam Weber, New York City..... 388

SELF-SEALING MOUTHPIECE DOORS.
Isbell-Porter Co., New York City..... 394
Continental Iron Works, Brooklyn, N.Y..... 394
Logan Iron Works, Brooklyn, N. Y..... 396
R. D. Wood & Co., Phila., Pa..... 394

INCANDESCENT GAS LAMPS.
Welsbach Commercial Co., Phila., Pa..... 386

BURNERS.
C. A. Gefrorer, Phila., Pa..... 394
Wm. M. Crane Co., New York City..... 379
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 379

LAVA GAS TIPS.
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 379

STREET LAMPS.
Welsbach Street Lighting Co., New York and Phila..... 384
Thos. T. W. Miner, New York City..... 376

PURIFIERS.
Stacey Mfg. Co., Cincinnati, O..... 384

PURIFYING MATERIALS.
Connelly Iron Sponge and Governor Co., New York City 389

VALVES.
Ludlow Valve Manufacturing Co., Troy, N. Y..... 381
Chapman Valve Manufacturing Co., Boston, Mass..... 381
R. D. Wood & Co., Phila., Pa..... 384
Continental Iron Works, Brooklyn, N. Y..... 384
The P. H. & F. M. Roots Co., Connersville, Ind..... 383
Isbell-Porter Co., New York City..... 394
The Western Gas Construction Co., Fort Wayne Ind.... 360

EXHAUSTERS.
The P. H. & F. M. Roots Co., Connersville, Ind..... 383
Isbell-Porter Company, New York City..... 394
Connelly Iron Sponge and Governor Co., New York City 389

ELECTRICAL APPARATUS.
Wm. Henry White, New York City..... 395

ENGINES AND BOILERS.
The Hazelton Boiler Company, New York City..... 376

PURIFIER SCREENS.
John Cabot, New York City..... 381

GAS STOVES.
American Meter Co., New York and Philadelphia..... 385
Maryland Meter and Manufacturing Co., Baltimore, Md. 398
Keystone Meter Co., Royersford, Pa..... 398
Wm. M. Crane Co., New York City..... 378
Nathaniel Tufts Meter Co., Boston Mass..... 398
National Stoves, Lorain, O..... 376
Abendroth Brothers, Port Chester, N. Y..... 376
Detroit Stove Works, Detroit, Mich..... 377

HOT WATER HEATERS.
Wm. M. Crane Co., New York City..... 378

GASHOLDER TANKS.
J P. Whittier, Brooklyn, N. Y..... 393

GASHOLDERS.
Bartlett, Hayward & Co., Baltimore, Md..... 393
Continental Iron Works, Brooklyn, N. Y..... 394
Deily & Fowler, Philadelphia, Pa..... 396
Davis & Farnum Mfg. Co., Waltham, Mass..... 392
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 392
Stacey Mfg. Co., Cincinnati, Ohio..... 395
R. D. Wood & Co., Philadelphia, Pa..... 394
Logan Iron Works, Brooklyn, N. Y..... 396
Riter-Conley Mfg. Co., Pittsburgh, Pa..... 395
Chris. Cunningham & Son, Brooklyn, N.Y..... 380

GAS SECURITIES.
Henry Marquand & Co., New York City..... 376

ADVERTISING.
J. Howland Harding, New York City..... 376

BOOKS, ETC.
Newbigging's Handbook..... 384
Field's Analysis, 1898..... 221
Scientific Books..... 390
Digest of Gas Cases..... 391
Practical Photometry..... 388
Gas Flow Computers..... 398
Hughes' "Gas Works"..... 389
Gas Engineer's Pocket-Book..... 220
Excerpts from Reports of Gas Commissioners..... 399
Binders..... 397
Directory of Gas Companies..... 395
Practical Handbook on Gas Engines..... 344
Coal Tar Tree..... 384

POSITION WANTED

As Superintendent of Plant,

Or on construction of gas works. Satisfaction guaranteed and references exchanged, by young married man.

1289-4 Address "H. E. L," care this Journal.

POSITION WANTED

As Meter Repairer or Gasfitter,

By a young man who has had experience in the gas stove business and prepayment meters. Can give the best of references. Address "G. M.,"

1291-1 Care this Journal.

Position Wanted

As Manager or Engineer of a Gas Company.

Thoroughly Competent Gas Manager of many years' experience in the manufacturing and the executive ends of a Gas Company desires a position as Manager or Engineer of a Gas Company selling not less than 50,000,000 cubic feet per annum. Highest references given. Address "T.,"

1267-tf Care this Journal.

A HUSTLER

Wants to Connect

With broken down Gas Company that needs him.

Address "C.,"

1291-1 Care this Journal.

WANTED,

Correspondence with Gas Company having sendout of 20,000,000 or over annually, who desire to employ an up-to-date, all-round gas engineer, to take full charge of their works and economically manage same; also increase their output by the pushing of gas stoves, etc. Am at present in full charge of works showing an increase in output of 30 per cent. the past year. As to ability, character and experience, can furnish A-1 gas engineers as reference; also two National Banks. Coal gas works preferred. Object of change, better salary. Address "R. G. H.," 1503 Wyandotte Street,

1289-3 Kansas City, Mo.

Gas Meters for Sale.

We have for sale good second-hand gas meters, 3 lights, $2.50; 5 lights, $3; larger sizes in proportion.

THE COLUMBUS GAS COMPANY,

1291 tf Columbus, O.

For Sale.

A Small Gas and Electric Light Plant,

in a Southern city of 3,800 inhabitants.

Address FORT WAYNE ELECTRIC CORPORATION,

1097-tf Fort Wayne, Ind.

Backus Gas Heaters at 1/4 Cost Price!

We have for sale, at one-fourth cost price, a lot of Backus Gas Heaters. Most of them have never been used. Write for list and particulars.

THE COLUMBUS GAS COMPANY,

1238-tf COLUMBUS, O.

Teacher of Cookery.

CORA M. RUSSELL.

Two years' experience in demonstration lectures. Familiar with gas ranges. For particulars, address

1289-3 BOX 93, White Plains, N. Y.

CORNELL & UNDERHILL,

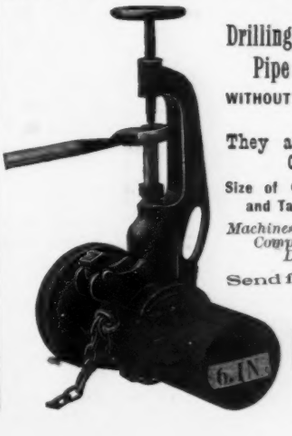
Wrought & Cast Iron Pipe,

MALLEABLE AND CAST IRON FITTINGS,

Brass and Iron Cocks and Gate Valves,

13 GOLD STREET, NEW YORK.

GAS TAPPING MACHINES



—FOR—

Drilling and Tapping Pipe under Pressure

WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

Size of Combination Drills and Taps 3/4 to 4-inch.

Machines Sent to any Gas Company for Thirty Days' Trial.

Send for Circulars.

Geo. Light,

DAYTON, O.

King's Treatise

A second hand set of King's Treatise, in good order, wanted by

"ENGINEER," care this Journal.

PLANS ADVICE WRITING ILLUSTRATING
J. HOWLAND HARDING,
ADVERTISING,
1545 BROADWAY
LONG ACRE SQUARE
NEW YORK

HENRY MARQUAND & CO.,
BANKERS
AND
BROKERS.
160 Broadway, New York City.

Utilize Your Gas Liquor.
NO EXTRA LABOR OR OPERATING EXPENSES.
Ammonia Concentrator,
Not Expensive. Write to
STROH & OSIUS, Pat'ees, or
Mich. Ammonia Works, Detroit, Mich.

REMOVAL NOTICE.

The Hazelton Boiler Company

have removed to their NEW WORKS at Rutherford, New Jersey.
Please address all communications to the Company at their New Office, 120 Liberty Street, N. Y. City.

"THE MINER"
Globe
Street and Boulevard
Lamps.
Cheapest and Best.
THOUSANDS IN USE WITH INCANDESCENT BURNERS.
Send for Catalogues.
THOMAS T. W. MINER,
821-823 Eagle Av., N.Y.

THE ANDERSON Patent Cutter Carrying Link
Made in all sizes.

Will cut from 2 in. to 24 in.
Pipe Cutting Tool

For Cutting Cast, Wrought Iron, Gas & Water Pipes.
THE ANDERSON PIPE CUTTER COMPANY, Manufacturers,
163 Liverpool st., E. Boston, Mass
N. Y. Office, 135 Greenwich St.
C. H. TUCKER, JR., Manager.
WALDO BROS.,
102 Milk Street, Boston, Mass.

DIRECT ACTION GAS RANGE

Is the Most Economical Gas Consumer on the Market.

We can and will prove this to you if you desire. SEVEN FEET OF GAS will turn out a baking of biscuits well done. Write us, we can save you some trouble.

"NATIONAL STOVES,"
LORAIN, OHIO.

YORK GAS RANGE,

Possessing Features Found in No Other.

HIGH IN EFFICIENCY, HANDSOME IN DESIGN.

The construction of our oven for 1900 is entirely new, BEING QUICK and ECONOMICAL.

Our New Catalogue is now ready, if you have not received a copy, send us your name and address and we will be pleased to send you copy.

ABENDROTH BROS.,

109-111 Beekman St., New York City. Port Chester, N. Y.

LARGEST

A MATTER OF CAPACITY.

It is right and fit that the biggest stove works in the world should make the greatest number of gas stoves.

It is a matter of simple reasoning that the house which makes the most gas stoves should make the best.

If the Detroit Jewel Gas Stoves were not the best we would not be making more gas stoves than are made by any other house.

These things go by merit.

We could not have built up a paying and lasting business manufacturing an article that did not pay and did not last.

We are in a position to hire the best help and to pay our workmen the biggest wages, and therefore to make the best gas stoves.

We make our stoves from start to finish, including the castings.

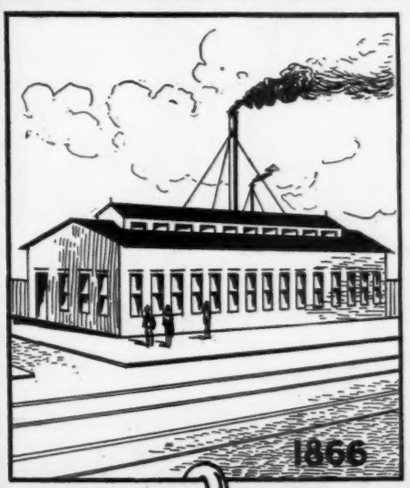
We are one of the very few gas stove makers who do this.

It has proved profitable to us to make a good gas stove, as our success with the Detroit Jewel shows.

It will prove profitable to you to push this stove with your customers, and teach them to burn gas in the daytime as well as at night.

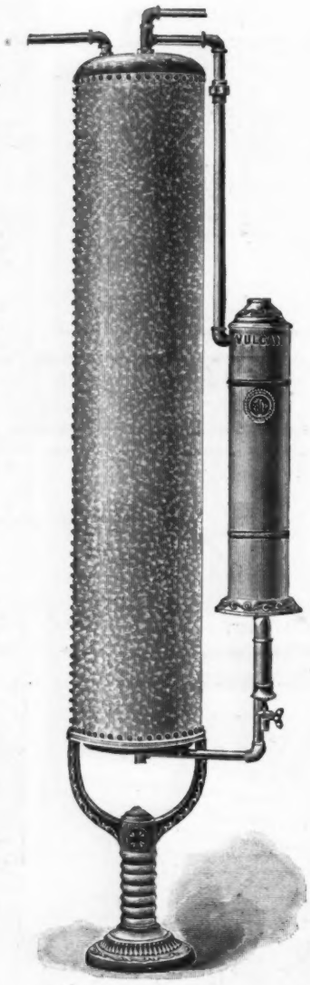
Gas is the best fuel to burn, and the Detroit stove is the best to burn it in.

DETROIT STOVE WORKS,
DETROIT and CHICAGO.



CHARLES AUSTIN BATES N Y

New "Vulcan" Water Heater No. 7.



The **No. 7 "Vulcan" Water Heater** will heat the water in house boilers up to 40 gallons.

No better heater on the market for efficiency and economy of gas. Compactly made and easily attached to the boiler.

The cold water inlet passes up through the center of the heater to the head, which is made of solid **brass** casting, from which the water is forced through twelve ¾-inch tubes to the hot water outlet inside of brass casting direct to top of boiler.

A powerful burner using 25 feet per hour, with an adjustable air mixer, is furnished with each heater, and so placed that the space occupied is **vertical,** the mixing chamber not protruding at right angles to the boiler.

Tubes can easily be cleaned and sediment removed—a plug being attached to each pair of tubes.

Heater is lined with asbestos to prevent loss of heat.

This heater can be used in connection with the water back on the coal range if desired.

Complete line of Gas Appliances for Cooking, Heating, Lighting and Manufacturing Purposes.

Sole Agents in the United States for Bray Burners.

WILLIAM M. CRANE COMPANY,

1131-1133 Broadway, New York.

FOUNDRY, PEEKSKILL, N. Y.

OUR NEW CATALOGUE, No. 17, Mailed on Application.

W. H. PEARSON, Prest. W. H. PEARSON, Jr., Vice-President. J. T. WESTCOTT, M.E., Manager. L. L. MERRIFIELD, M.Inst.M.E., Chief Engineer.

THE ECONOMICAL GAS APPARATUS CONSTRUCTION CO., LD.

American Offices: 269 FRONT STREET, EAST, TORONTO, ONT.
London Offices: 19 ABINGDON STREET, WESTMINSTER, S.W.

Telegraphic Address: "CARBURETED LONDON AND TORONTO."

The above Company have erected since 1893, or are now erecting, their universal type of Carbureted Water Gas Plants at the following Gas Works:

	Cubic Feet Daily.
Blackburn, Eng.	1,250,000
Windsor Street Works, Birmingham, Eng.	2,000,000
Saltley Works, Birmingham, Eng.	2,000,000
Colchester, Eng.	300,000
Birkenhead, Eng.	2,250,000
Swindon (New Swindon Gas Co.), Eng.	120,000
Saltley Works, Birmingham, Eng. (2d Contract)	2,000,000
Windsor St. W'ks, Birming'm, Eng. (2d Contract)	2,000,000
Halifax, Eng.	1,000,000
Toronto,	250,000
Ottawa,	250,000
Toronto (Second Contract, Remodeled),	2,000,000
Lindsay (Remodeled),	125,000
Belleville,	250,000
Ottawa (Second Contract),	250,000
Brantford (Remodeled)	200,000
St. Catherine's (Remodeled),	250,000
Kingston, Pa.	125,000
Montreal,	500,000
Peterborough, Ont.	250,000
Wilkesbarre, Pa.	750,000
St. Catherine's (Second Contract),	250,000
Buffalo, N. Y.	2,000,000
Winnipeg, Man.	500,000
Colchester, Eng. (Second Contract),	300,000
York, Eng.	750,000
Rochester, Eng.	500,000
Kingston, Ont.	300,000
Crystal Palace District, Eng.	2,000,000
Duluth, Minn.	300,000
Caterham, Eng.	150,000
Enschede, Holland,	150,000
Leicester, Eng.	2,000,000
Buenos Ayres (River Platte Co.),	700,000
Burnley, Eng.	1 500,000

PHOTOMETRIC

Tests made by the EXPERTS of

New York, Chicago

and other large cities, give

Steward's Burners

HIGHER CANDLE POWER THAN ANY OTHER UNION JET BURNER.

The D. M. Steward Mfg. Co.,

New York Office, 107 CHAMBERS ST.

CHATTANOOGA, Tenn.

GAS COMPANIES

Should consider the advantage to be gained in forestalling criticism and avoiding complaint by furnishing for every cubic foot of gas consumed by their customers the fullest equivalent in lighting power.

BRAY BURNERS are made for high and low pressure. We invite the utmost test and comparison with all burners on the market.

W. M. CRANE COMPANY,

THE THOMAS DAY COMPANY, Distributing Agents for the Pacific Coast, SAN FRANCISCO, CAL.

Sole Agents for the United States,

1131 & 1133 Broadway, New York.

SAFETY GAS MAIN STOPPER CO.

211-E. 116 TH ST. N.Y.

FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS

THE LINK-BELT MACHINERY CO.,

ENGINEERS, FOUNDERS, MACHINISTS,
Chicago, U. S. A.

"Link-Belt" Breaker.

LINK-BELT ELEVATING & CONVEYING MACHINERY for HANDLING COAL, COKE, OXIDE, ETC

Tilting Coal and Coke Cars,
Breaker Rolls, Shaking Screens,
Power Transmitting Machinery

Machinery designed and erected to suit existing conditions and available space.

CATALOGUE UPON APPLICATION.

Sutherland Construction & Improvement Co.

Offices: 15 WALL ST., NEW YORK, and OSHKOSH, WISCONSIN.

Owners of the "SUTHERLAND" Patents for Water Gas Apparatus.

Gas, Electric Light, Water Works, and Electric Street Railways Built, Remodeled, Operated, Bought and Sold.

A few of the places where the SUTHERLAND Apparatus is in successful operation:

Ilion, N. Y.
Herkimer, N. Y., 2 orders.
Little Falls, N. Y.
Fishkill-on-Hudson, 2 orders.
Clifton Springs, N.Y., 2 orders.
Green Bay, Wis.
Stevens Point, Wis.
Tarrytown, N.Y., 3 orders.
Ft. Henry, N. Y.
Gainsville, Fla.
Hollidaysburg, Pa.
Waterville, N. Y.
Huntington, L. I.
Lexington, Mo.
Mendota, Ill.
Circleville, O.
Joplin, Mo.
Ashville, N. C.
Youngstown, O.
Kingston & Rondout, N. Y.

CORRESPONDENCE SOLICITED.

CHRIS. GUNNINGHAM & SON,

PROPRIETORS,

THE NOVELTY STEAM BOILER WORKS,

BROOKLYN, N. Y.

STORAGE TANKS FOR GAS WORKS,

To Retain Fluid Material of Any Sort.

PIPING IN AND AROUND GAS WORKS.

Work Done for Several of the Largest Gas Companies in America Stands as Reference.

NOTICE.

We have in our yard, at East Berlin, Conn., a very large stock of beams, channels, angles, plates and other structural material of high quality. We are able to furnish from this stock any ordinary bridge, building, roof or other structural work promptly and with no delay. We invite correspondence.

THE BERLIN IRON BRIDGE CO.,

BOSTON OFFICE:
Room 200,
Equitable Building.

NEW YORK OFFICE!
Room 718 Bennett Building,
Cor. Fulton and Nassau Sts.

MAIN OFFICE AND WORKS:
EAST BERLIN, CONN.

John Cabot,

553-557 West Thirty-third Street, New York.

Church's Patent

AND

Bolted Trays,

FOR ALL KINDS OF

Gas Purification.

Send for Circulars.

CHAPMAN VALVE MANUFACTURING CO.

MANUFACTURERS OF

Valves and Gates for Gas, Ammonia, Water, Etc.

Also, Gate Fire Hydrants with and without Independent Nozzle Valve. All Work Guaranteed.

Works & Gen'l Office, Indian Orchard, Mass. Treasurer's Office, 72 Kilby & 112 Milk Sts., Boston, Mass.
Chicago Office, 24 West Lake St. New York Office, 28 Platt St.
St. Louis Office, L. M. Rumsey Mfg. Co., 810 North Second St.

Bristol's Recording

PRESSURE GAUGE.

For continuous records of **Street Gas Pressure.** Simple in construction, accurate in operation, and low in price.

Fully Guaranteed. Send for Circulars.

THE BRISTOL CO.,

Waterbury, Conn.

THE

Ludlow Valve Mfg. Co.,

TROY, N. Y., U. S. A.

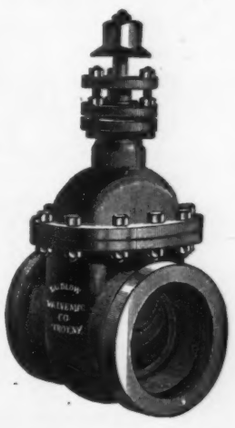
Double and Single Gate Valves, ¼" to 72",

—FOR—

Gas, Water, Steam, Oil, Ammonia, Etc.

HOT GAS VALVES A SPECIALTY.

Send for Catalogue.



AMERICAN GAS COMPANY

Constructors of Coal Gas Apparatus.

BREDEL'S SYSTEM Recuperative Furnaces, Washers, Condensers, Purifiers and Purifying Machines, Ammonia Plant, Coke Conveyers, Charging and Discharging Machines, Etc.

Complete Works Erected with Guaranteed Results.

EASTERN AGENTS FOR

BREDEL'S SYSTEM COAL GAS PLANTS AND GAS APPARATUS. | **P. H. & F. M. ROOTS CO.'S** Exhausters, Governors, etc.

GENERAL AGENTS FOR

BRONDER'S CHARGING AND DISCHARGING MACHINES.

AMERICAN GAS COMPANY,

222 South Third Street, Philadelphia, Pa.

FRED. BREDEL, C.E.

Coal and Water Gas Plants.

OWN SYSTEM.

RECUPERATIVE FURNACES, WASHERS, CONDENSERS, PURIFIERS, PURIFYING MACHINES, COKE CONVEYERS, ETC

SOLE UNITED STATES AGENT FOR

ARROL-FOULIS MECHANICAL CHARGING AND DRAWING MACHINES.

Gas Enriching Plants to Enrich Coal Gas up to 24 Candle Power, and Making a White, Bright, Non-smoking Gas

GAS RETORTS AND SPECIAL BLOCKS AND FIREBRICK MANUFACTURED UNDER THE SUPERINTENDENCE OF MY OWN CHEMIST.

COMPLETE GAS WORKS

No. 118 Farwell Avenue, · Milwaukee, Wis

Eastern Agents: AMERICAN GAS CO., Construction Department, 222 So. 3d St., Phila., Pa

ROOTS'

LATEST IMPROVED GAS EXHAUSTER

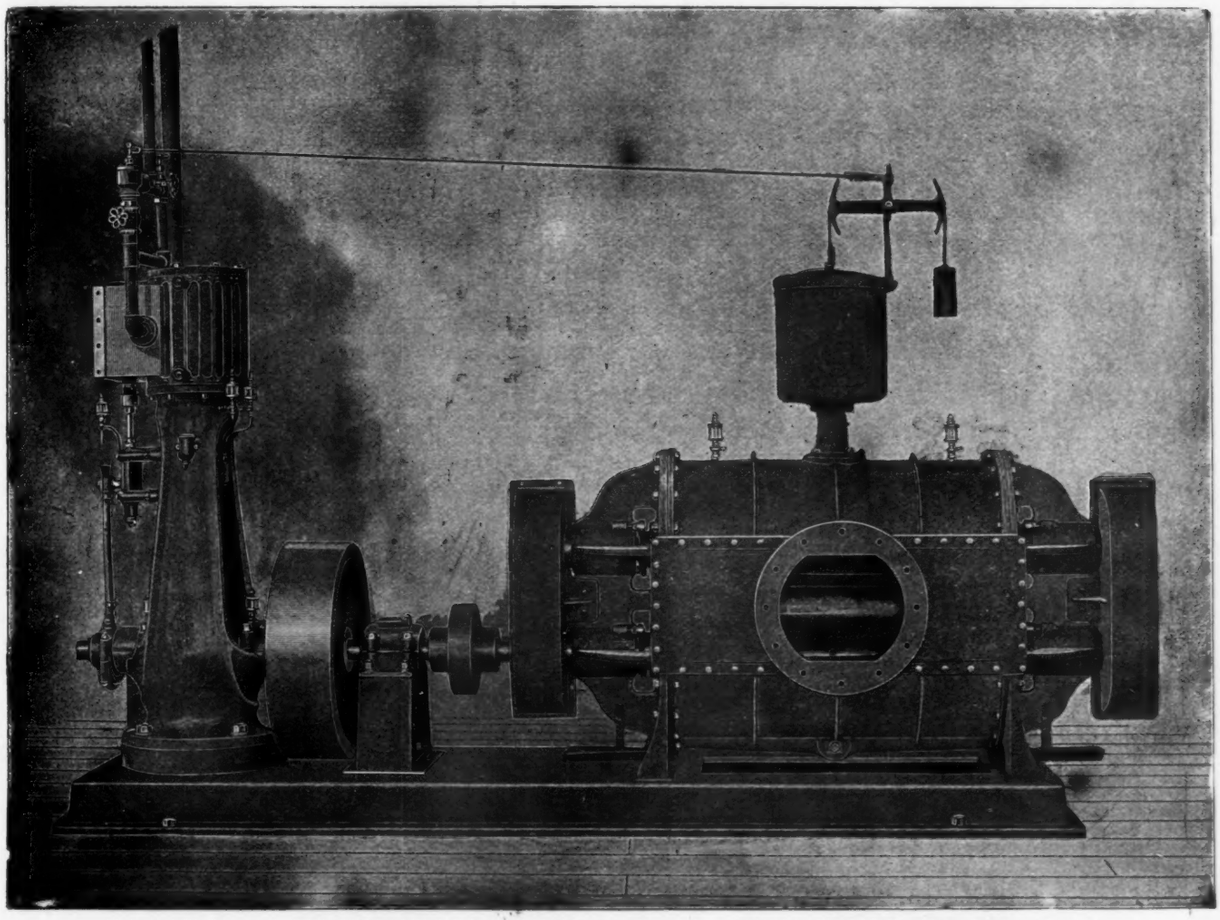
—AND—

NEW GAS GOVERNOR AND STEAM VALVE.

GUARANTEED TO REGULATE WITHIN ONE-TENTH OF AN INCH, WATER PRESSURE.

The Most Perfect Gas Governor on the Market.

MORE DIRECT IN ACTION. FEWER PARTS.
EASIER TO ADJUST THAN ANY OTHER GOVERNOR.



INQUIRIES CHEERFULLY ANSWERED. WRITE FOR CATALOGUE.

P. H. & F. M. ROOTS CO.,

Connersville, Ind. 109 Liberty St., New York.

Eastern Office:

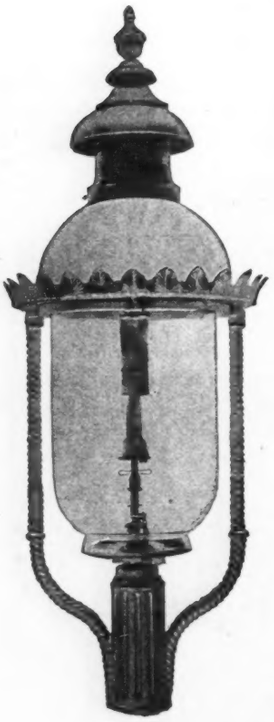
American Gas Company,

222 South Third Street, Philadelphia, Pa.

NEW YORK, 33 Nassau St. PHILADELPHIA, Broad and Arch Sts. CHICAGO, 54 Lake St.

Welsbach Street Lighting Company

.... OF AMERICA ....



No. 36.

Controls and Operates the

Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in seventy-five Cities and Towns.

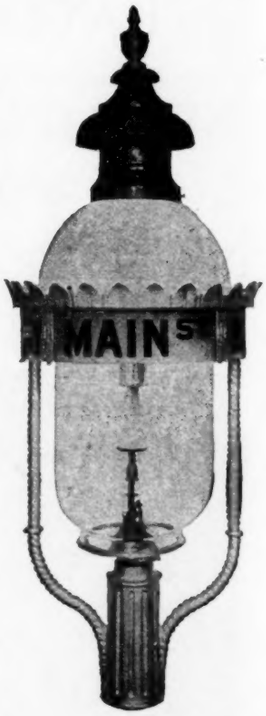
By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

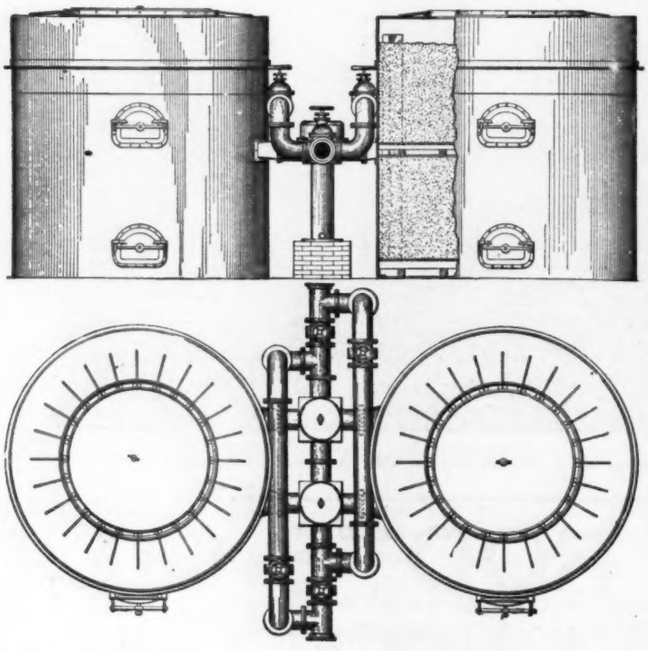
IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.



No. 38.

Correspondence solicited from Gas Companies and others interested in Municipal and outside lighting.



CHOLLAR'S SYSTEM OF GAS PURIFICATION.

Covered by Five U.S. Patents.

In operation, revivification of the oxide is effected by repeated reversals of the direction of the flow of the gas through the beds (in the two boxes used under this system there are eight different routes for the gas to take) whereby the purified gas is made to revive the oxide in parts of the apparatus while the foul gas is fouling it in others.

The boxes are charged or discharged from the sides as well as the top.

There are no Hydraulic Cups or heavy covers.

Either end of the apparatus is inlet or outlet at pleasure.

The capacity is increased five-fold or more over ordinary methods without addition to building.

The apparatus costs less than for any other system.

For Estimates Write **The Stacey Mfg. Co.,**
SOLE MANUFACTURERS,
FOR FURTHER INFORMATION WRITE CINCINNATI, OHIO.
B. E. CHOLLAR, 411 N. 11th St., St. Louis, Mo.

Coal Tar Genealogical Tree.

Mr. T. Viner Clarke, of London, Eng., having compiled a novel Chart or Map illustrating the various CHEMICAL PRODUCTS DERIVED FROM COAL AND COAL TAR, in the form of a Genealogical Tree, including all the products discovered (the total number amounting to near 700), offers for sale a limited number of copies in Colors, mounted on Linen, with Rollers. Price, $3.50. Orders may be sent to

A. M. CALLENDER & CO., No. 32 Pine Street, New York

(Copyrighted, 1894, by the AMERICAN METER CO.

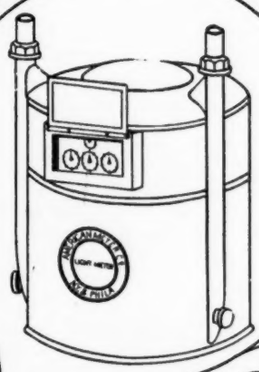
AMERICAN METER CO.

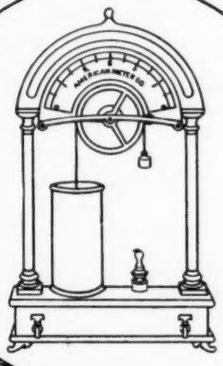
ESTABLISHED 1834. INCORPORATED 1863.

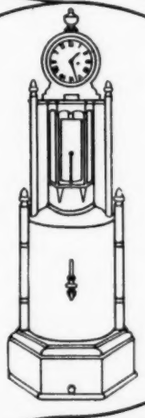
NEW YORK AND PHILADELPHIA,

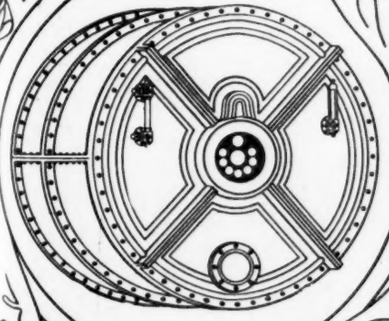
CHICAGO, ST. LOUIS,

SAN FRANCISCO.









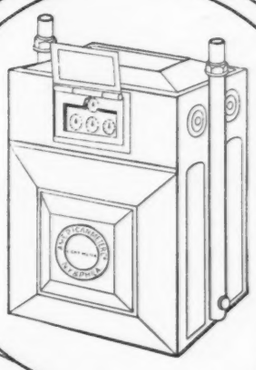
PUBLIC LIGHTING TABLE.

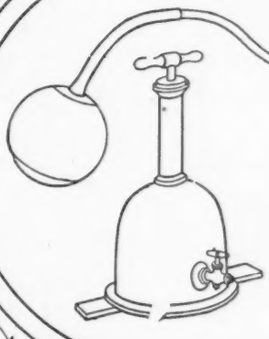
MARCH, 1900.

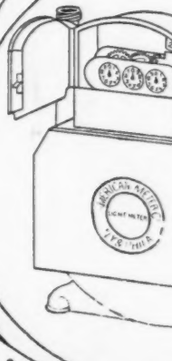
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. Extinguish.
				P.M.	A.M.
Thu.	1	6.20 PM	5.30 AM	5.30	5.45
Fri.	2	6.20	5.30	5.30	5.45
Sat.	3	6.20	5.30	5.30	5.45
Sun.	4	6.20	5.20	5.30	5.45
Mon.	5	10.20	5.20	5.40	5.35
Tue.	6	11.30	5.20	5.40	5.35
Wed.	7	12.30 AM FQ	5.20	5.40	5.35
Thu.	8	1.20	5.20	5.40	5.35
Fri.	9	2.00	5.20	5.40	5.35
Sat.	10	2.40	5.20	5.40	5.35
Sun.	11	3.10	5.10	5.40	5.35
Mon.	12	3.40	5.10	5.50	5.20
Tue.	13	4.00	5.10	5.50	5.20
Wed.	14	No L.	No L.	5.50	5.20
Thu.	15	No L. FM	No L.	5.50	5.20
Fri.	16	No L.	No L.	5.50	5.20
Sat.	17	6.40 PM	8.40 PM	5.50	5.20
Sun.	18	6.40	9.40	5.50	5.20
Mon.	19	6.40	10.40	6.00	5.10
Tue.	20	6.40	11.40	6.00	5.10
Wed.	21	6.40	12.40 AM	6.00	5.10
Thu.	22	6.40	1.40	6.00	5.10
Fri.	23	6.40 LQ	2.30	6.00	5.10
Sat.	24	6.40	3.10	6.00	5.10
Sun.	25	6.50	4.00	6.00	5.10
Mon.	26	6.50	4.30	6.10	4.55
Tue.	27	6.50	4.50	6.10	4.55
Wed.	28	6.50	4.50	6.10	4.55
Thu.	29	6.50	4.50	6.10	4.55
Fri.	30	6.50 NM	4.50	6.10	4.55
Sat.	31	6.50	4.50	6.10	4.55

TOTAL HOURS LIGHTING DURING 1900.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	230.50	January	423.20
February	175.40	February	355.25
March	189.00	March	355.35
April	160.30	April	298.50
May	150.40	May	264.50
June	137.00	June	234.25
July	152.00	July	243.45
August	171.50	August	280.25
September	187.20	September	321.15
October	213.10	October	374.30
November	221.50	November	401.40
December	231.50	December	433.45
Total, yr.	2221.40	Total, yr.	3987.45







"YUSEA"

A New Standard of Strength and Light.

THE UNITED GAS IMPROVEMENT COMPANY.

THE STANDARD JUNIOR,

THE STANDARD DOUBLE SUPERHEATER,

LOWE WATER GAS APPARATUS.

Total Sets Installed to January 1, 1900, - - - - - - - - 327

Total Daily Capacity - - - - - - - - - 207,425,000 Cu. Ft.

WATER GAS PLANT AS AUXILIARY TO COAL GAS WORKS.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY Prest. DAVID R. DALY V. Prest. & Treas.
H. D ABERNETHY. Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

MANUFACTURERS OF

CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

E. D. WHITE, President. A. H. GUTKES, Vice-President. H. A. PERKINS, Secretary.

Brooklyn Fire Brick Works,

MANUFACTURERS OF

CLAY RETORTS, FIRE BRICK,
Gas House and other Tile.

Office, 88 Van Dyke St. Brooklyn, N. Y.

Established 1854. Incorporated 1869.

LACLEDE
Fire Brick Manufg. Co.,

Manufacturers of GAS RETORTS . .
FIRE BRICK . . .
RETORT SETTINGS

Water Gas Cupola Linings, Fire Clay, Etc.

Exclusive Agents for

The Mitchell Half-Depth Regenerative Furnace.

This is the *original* coal-consuming Furnace for Retort Benches. Burns either Coal or Coke. Full and Half-Depth Regenerative Furnaces for Benches of 6's, 7's, 8's or 9's erected complete.

Proprietors of the Coze System of Inclined Retorts.

Office: 901 Pine St., **St. Louis, Mo.**

The Construction of Gas Works

PRACTICALLY DESCRIBED,

By WALTER RALPH HERRING.

Price $2. For Sale by

A. M. CALLENDER & CO.,

32 Pine Street, N. Y. City.

Adam Weber,

Proprietor,

Manhattan Fire Brick and Enameled Clay Retort Works.

Works, Weber, N. J.

Office, 633 East 15th St., New York.

Modern Recuperative Furnaces

And Standard Fire Brick and Gas Retorts

Works, LOCKPORT STATION, PA.

—ESTABLISHED 1864.—

JAMES GARDNER, JR.,

Hamilton Building, Fifth Avenue, PITTSBURGH, PA. P. O. Box 373.

Successor to WILLIAM GARDNER & SON

Fire Clay Goods for Gas Works.

SOLE REPRESENTATIVE OF THE McILHENNY REGENERATIVE BENCHES FOR THE U. S.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY

RETORT WORKS

WORKS, Perth Amboy, N. J.

OFFICE, 418 to 422 East 23d St., N. Y.

Clay Gas Retorts,

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

Price List, f.o.b. Galesburg or Mount Vernon.

In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD, Galesburg, Ills.

Eastern Agent. PERRY BORDEN, 19 Prospect Ave., MOUNT VERNON, N. Y.

Parker-Russell Mining and Mfg. Co.,

CITY OFFICE,
417 Pine Street, St. Louis, Mo.

PROPRIETORS OF THE

OAKHILL GAS RETORT & FIRE BRICK W'KS

Our immense establishment is now employed almost entirely in the manufacture of

Materials for Gas Companies

We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We construct

Half and Full Depth Benches of Our Own Design,

Containing 6, 8 or 9 Retorts.

We have Greatly Improved our Recuperators. Coal or Coke can be used as Fuel in Furnaces.

THEO. J. SMITH, Prest. J. A. TAYLOR, Sec
A. LAMBLA, Vice-Prest. and Supt.

BALTIMORE
RETORT & FIRE BRICK CO.

MANUFACTORY AT

LOCUST POINT BALTIMORE MD.

Clay Retorts, Blocks & Tiles

FIRE BRICK, FIRE CLAY,
AND FIRE CEMENT.

Red and Buff Ornamental Tiles and Chimney Tops. Baker Oven Tiles 12x12x2 and 18x18x2.

WALDO BROS., 102 MILK ST., BOSTON, MASS.

Sole Agents for New England States.

PRACTICAL PHOTOMETRY.

A Guide to the Study of the Measurement of Light.

By WILLIAM JOSEPH DIBDIN.

With Numerous Illustrations Price, $3.00. A M CALLENDER & CO., 32 Pine Street, N. Y. City

National Gas and Water Company.

CONTRACTORS FOR
Gas Plant Machinery

SOFT COAL OR COKE
WATER GAS GENERATORS
A SPECIALTY.

218 LA SALLE ST.,
CHICAGO.

Gas Engineers
INSPECTION AND ADVICE.

PLANS AND ESTIMATES
FOR IMPROVEMENTS OR
REPAIRS.

CONNELLY IRON SPONGE AND GOVERNOR CO.,

(Successors to CONNELLY & CO.)
MANUFACTURERS OF GAS WORKS SPECIALTIES.

"IRON SPONGE." Saves money, saves labor, and is the most efficient purifying material ever offered as a substitute for lime. We guarantee a large saving, both in cost of material and labor.

AUTOMATIC GOVERNOR.
OVER FOUR HUNDRED NOW IN USE! NO WORKS COMPLETE WITHOUT IT!
WILL PAY FOR ITSELF WITHIN A YEAR! ITS SERVICE SECURES PERFECT DISTRIBUTION!
REDUCES LEAKAGE TO MINIMUM, and BENEFITS THE COMPANY and CONSUMER ALIKE!
IT IS THE ONLY RECOGNIZED AUTOMATIC GOVERNOR IN THE WORLD!

STEAM JET EXHAUSTER. Designed particularly for small works. Combines Exhaust Tube, Steam Governor, Gas Compensator and Bye-Pass Valves in the most compact form possible. Occupies but little space; uses very little steam; saves formation of carbon in retorts; increases yield 10 to 15 per cent. No works too small to use them profitably.

Prices given on all our specialties, delivered at any point in the United States. Correspondence solicited.

CONNELLY IRON SPONGE AND GOVERNOR CO., No. 357 Canal St., New York.

Hughes' "Gas Works,"

Their Construction and Arrangement,

And the Manufacture and Distribution of Coal Gas.

Originally written by SAM'L HUGHES, C.E.

Rewritten and Much Enlarged by
WM. RICHARDS, C.E

Eighth Edition, Revised, with Notices of Recent Improvements.

Price, $1.65.

A. M. CALLENDER & CO.,
32 Pine St., N. Y. City.

Parson's Steam Blower,

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREEZE OR OTHER WASTE MATERIAL.

PARSON'S TAR BURNER,

FOR USING COAL TAR AS FUEL.

PARSON'S AIR JET TUBE CLEANER,

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial*. No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY.

H. E. PARSON, Supt., 457 Putnam Ave., Brooklyn, N. Y

The Chemistry of Illuminating Gas.

By NORTON H. HUMPH Price, $2.40.

A. M. CALLENDER & CO., 32 PINE ST., N. Y. CITY.

The Gas Engineer's Laboratory Handbook.

By JOHN HORNBY, F.I.C.

Price, $2.50.

A. M. CALLENDER & CO., 32 Pine Street, N.Y. City.

Practical Hints on the Construction and Working of Regenerator Furnaces,

By MAURICE GRAHAM, Assoc M.Inst.C.E.

Price, $1 25. For Sale by

A. M. CALLENDER & CO., No. 32 Pine Street, New York City.

JAMES D. PERKINS, President. F. SEAVERNS, Treasurer.

THE PERKINS COMPANY,

228 and 229 Produce Exchange, New York City.

TIDEWATER SALES AGENTS FOR THE FOLLOWING:

Ocean Mine Youghiogheny Gas Coal,
Old Kentucky Shale and O. K. Boghead.

SHIPMENTS FROM NEW YORK, PHILADELPHIA, BALTIMORE AND NORFOLK.

BERWIND-WHITE COAL MINING COMPANY'S

Ocean Westmoreland Gas Coal.

Offices:
Washington Building, New York.
Betz Building, Philadelphia.

STRICTLY High Grade. . . . . Carefully prepared. For Gas Making or Heavy Steaming.

SCIENTIFIC BOOKS.

GAS MANUFACTURE, THE CHEMISTRY OF, by W. J. A. Butterfield. $3.50.
NEWBIGGING'S HANDBOOK. By Thos. Newbigging. 6th edition. $6.
COX'S GAS FLOW COMPUTER. $2.50.
FIELD'S ANALYSIS, 1898. $5.
HUGHES' GAS WORKS. $1.65.
POOLE ON FUELS. By Herman Poole. $3.
GAS ENGINEER'S POCKET-BOOK. By Henry O'Connor. $3.50.
TECHNICAL GAS ANALYSIS. $3.
GAS CONSUMER'S HANDYBOOK, by Wm. Richards. 20 cents.
CHEMISTRY OF ILLUMINATING GAS. By Norton H. Humphrys. $2.40.
PRACTICAL TREATISE ON HEAT By Thomas Box. 2d edition. $5.
PRACTICAL PHOTOMETRY: A Guide to the Study of the Measurement of Light. By W. J. Dibdin. $3.
CHEMICAL TECHNOLOGY: Vol. I., *Fuel and Its Applications*, $5. Vol. II., *Lighting*, $4.
IRONWORK: Practical Designing of Structural Ironwork. By H. Adams. $3.50.
HEMPEL'S GAS ANALYSIS, $2.
LIQUID FUEL FOR MECHANICAL AND INDUSTRIAL PURPOSES. By E. A. Brayley Hodgetts. $2.50.
COAL: Its History and Use. By Prof. Thorpe. $3.50.
PRACTICAL HANDBOOK ON GAS ENGINES, by G. Lieckfield. $1.

HEAT A MODE OF MOTION. By John Tyndall. $2.50.
THEORY OF HEAT. By J. Clerk-Maxwell. $1.50.
MANUAL FOR GAS ENGINEERING STUDENTS. By D. Lee. 40 cents.
GASFITTER'S GUIDE, by John Eldridge 40 cents.
AMMONIA AND AMMONIUM COMPOUNDS. By Dr. R. Arnold. $2
CONSTRUCTION OF GAS WORKS, by Walter Ralph Herring. $2.
DIGEST OF GAS CASES. $5.
PRACTICAL HINTS ON REGENERATOR FURNACES By M. Graham. $1.25.
A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS. By D. A. Graham. $3.
A TEXT BOOK OF INORGANIC CHEMISTRY. By Prof. Victor Von Richter. $2.
ILLUMINATING AND HEATING GAS. By W. Burns. $1.50
HANDBOOK FOR MECHANICAL ENGINEERS. By H. Adams. $2.50.
TREATISE ON MASONRY CONSTRUCTION. Baker. $5
GAS ENGINEER'S LABORATORY HANDBOOK. By Jno. Hornby. $2.50.
GAS LIGHTING AND GAS FITTING. By W. P. Gerhard. 50 cents.
PRACTICAL PLUMBING. By P. J. Davies. $3.

AMERICAN PLUMBING. By Alfred Revill. $2.
CEMENT; A Manual of Lime and Cement, their Treatment and Use in Construction. By A. H. Heath. $2.50.
A COMPARISON BETWEEN THE ENGLISH AND FRENCH METHODS OF ASCERTAINING THE ILLUMINATING POWER OF COAL GAS. $1.60.

ELECTRICITY.

INDUSTRIAL PHOTOMETRY, with Special Application to Electric Lighting. By A. Palaz, Sc.D. $4.
ELEMENTS OF ELECTRIC LIGHTING, Including Electric Generation, Measurement, Storage and Distribution. By Philip Atkinson. $1.50.
ELECTRIC TRANSMISSION OF ENERGY. By G. Kapp. $3.50.
ELECTRICIAN'S POCKETBOOK. By Monroe and Jamieson. $2.50.
MAGNETISM AND ELECTRICITY. By J. Overend. 40 cts
DYNAMO BUILDING. By F. W. Walker. 50 cents.
DOMESTIC ELECTRICITY FOR AMATEURS. By E. Hospitalier. $2.50.
PRACTICAL MANAGEMENT OF DYNAMOS AND MOTORS. $1.
PRACTICAL GUIDE TO THE TESTING OF INSULATED WIRES AND CABLES. $1.
ELECTRIC LIGHTING, by Francis B. Crocker. $3.
ELECTRIC LIGHT FITTING. $2.
PRACTICAL ELECTRICITY. $2.50.
ELECTRICITY FOR ENGINEERS. $2.50.
ELECTRICITY, Its Theory, Sources and Applications. By John T. Sprague. $6.

The above will be forwarded upon receipt of price. If sent by mail or express, postage or express charge must be added to above prices. We take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances should be made by check, draft, or post office money order. No books sent C.O.D.

A. M. CALLENDER & CO., 32 Pine Street, New York.

The Despard Gas Coal Co.,

MINERS AND SHIPPERS OF

DESPARD GAS COAL,

AND MANUFACTURERS OF

COKE.

MINES, - - Clarksburgh, Harrison Co., West Va.
WHARVES, - - - Locust Point Baltimore, Md.
OFFICE, - 640 Equitable Building Baltimore, Md.

ROUSSEL & HICKS, 71 Broadway, N. Y. } AGENTS, { BANGS & HORTON 60 Congress St., Boston.

KELLER ADJUSTABLE COKE CRUSHER.

Strong, Simple, Durable. Will Crush any Size Desired.

C. M. KELLER,
Sec. & Supt. Gas Lt. & Coke Co.,
Columbus, Ind.
Correspondence Solicited.

Do You Wish to Know

what size of pipe to use to convey any quantity of gas, any distance, with any loss of pressure and any initial or final pressure? Then use

Cox's Gas Flow Computer,

as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.

Price, 6.5 x 8 inches, in cloth case, $2.50. For sale by

A. M. Callender & Co., 32 Pine St., N. Y.

GREENOUGH'S "DIGEST OF GAS CASES."

Price, $5.00.

This is a valuable and important work, a copy of which should be in the possession of every gas company in the country, whether large or small. As a book of reference it will be found invaluable. It is the only work of the kind which has ever been published in this country, and is most complete. Handsomely bound. Orders may be sent to

A. M. CALLENDER & CO., 32 Pine St., N. Y.

— THE —

PENN GAS COAL CO.

OFFER THEIR

Coal, Carefully Screened and Prepared for Gas Purposes.

Their property is located in the Youghiogheny Coal Basin, near Irwin and Penn Stations on the Pennsylvania Railroad, and on the Youghiogheny River.

Principal Office:

Room 720, Reading Terminal Building, Phila., Pa.

Points of Shipment:

Pennsylvania Railroad Piers; Greenwich Wharves, Delaware River: Pier No. 1 (Lower Side), South Amboy, N. J.

EDMUND H. McCULLOUGH, Prest. CHAS. F. GODSHALL, Treas. H. C. ADAMS, Sec.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J., WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

THE SUN OIL CO.

Crude Oil, Gas Naphtha,
Refined Petroleum, Gas Oil.

Toledo, O., and Pittsburgh, Pa.

Standard Oil Company,

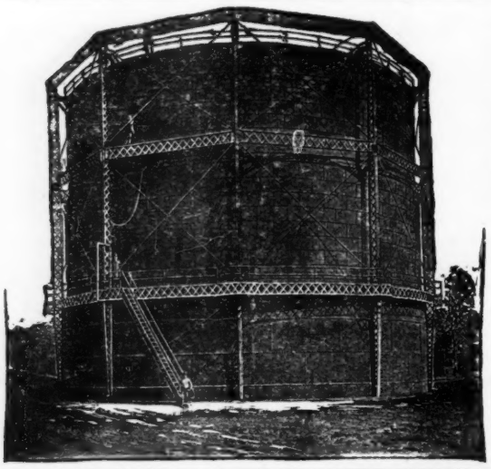
GAS NAPTHA DEPARTMENT.

GAS NAPTHA.

GAS OIL.

Correspondence Solicited.

26 Broadway, New York City.



DAVIS & FARNUM MFG. CO.,
WALTHAM, MASS.

Principal Office & Works, Waltham, Mass. Boston Office, R'm 18, Vulcan Bldg., 8 Oliver St.

Single, Double and Triple-Lift Gasholders of any Capacity. Tubular, Pipe and Sinuous Friction Condensers of all Sizes.

Steel Tanks for Gasholders, Iron Roof Frames and Floors, Purifying Boxes, Center Seal or Valve Connections, Bench Work, Reversible Lime Trays.

Self-Sealing and Pressed Steel Mouthpiece Lids.

Coke Borrows, Coal Wagons, and all Apparatus Requisite for a Complete Gas Works.

Also, Gas and Water Pipe, Flanged Pipe, Sugar House Work, and Special Castings of all Descriptions.

BAXTER & YOUNG,
CONTRACTING AND CONSULTING GAS ENGINEERS.

Examination and Values Ascertained of Artificial and Natural Gas Properties.

COMPLETE GAS WORKS ERECTED:

Artificial and Natural Gas Mains Furnished and Laid.

CORRESPONDENCE SOLICITED.

OFFICE: WAYNE COUNTY BANK BUILDING,
Rooms 201 & 202. DETROIT, MICH.

A. E. BOARDMAN, C. E.,
Consulting and Contracting Engineer.

Particular attention given to Gas, Water and Electric Plants. Long and successful experience with the problem and practice of

Filtration for Public Water Supply.

BREVARD, N. C.

JAMES T. LYNN,
GAS ENGINEER
AND
CONTRACTOR,

Wayne Bank Building, - DETROIT

GAS PROPERTIES PURCHASED.

Geo. Shepard Page's Sons.
GAS MACHINERY.

Correspondence Solicited.

180 Fulton Street, New York City.

DAVID LEAVITT HOUGH,
Consulting Engineer
AND
CONTRACTOR,
374 FIFTH AVE., N. Y

Kerr Murray Manufacturing Company,

Steel Gasholder Tanks,

SINGLE, DOUBLE AND TRIPLE-LIFT GASHOLDERS,

HORIZONTAL AND VERTICAL STORAGE OIL TANKS

Iron Work for Coal Gas Benches, Self-Sealing Mouthpieces, Exhausters, Condensers, Scrubbers, Purifiers, Wooden Trays, Floor Carriages, Center Seal and Valve System Connections, Cast and Wrought Iron Fittings, and Connections 3 to 36 Inches Diameter.

VALVES, Double Gate, Hub and Flange, Outside Screw and Quick Opening, 3 to 36 In. Diam.

COAL AND COKE WAGONS, RETORT HOUSE TOOLS, STREET MAIN SPECIALS AND DRIPS.

Address,

KERR MURRAY MANUFACTURING CO.
Fort Wayne, Indiana.

BARTLETT, HAYWARD & CO.

BALTIMORE, MD.

Triple, Double and Single-Lift Gasholders.

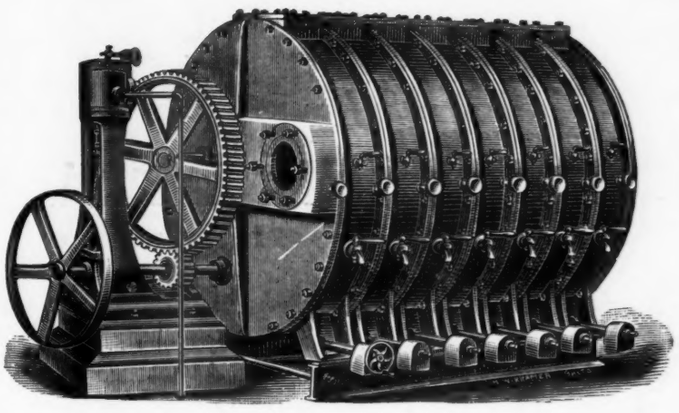
Iron Holder Tanks.

ROOF FRAMES.

Girders.

BEAMS

PURIFIERS.



CONDENSERS.

Scrubbers.

Bench Castings.

OIL STORAGE TANKS

Boilers.

PATENT STANDARD WASHER-SCRUBBER.

The best apparatus for the extraction of all Ammonia and a large proportion of Carbonic Acid and Sulphureted Hydrogen. The Scrubber has been materially improved and is provided with patented Wooden Segmental Grids, instead of Metallic Discs, thus reducing the weight on shaft and power for operating same

The Wilkinson Water Gas Process.

THIRTY-CANDLE, NON-CONDENSIBLE, FIXED GAS. THE MOST SUCCESSFUL GAS PROCESS IN OPERATION.

MILL'S REVERSIBLE LIME TRAYS.

Gas Works Designed and Constructed.

ALEX. C. HUMPHREYS, M. E., M. nst. C. E. ARTHUR G. GLASGOW, M. E., M. Inst. C. E.

HUMPHREYS & GLASGOW,

BANK OF COMMERCE BLDG.,
31 Nassau Street,
New York.

9 VICTORIA STREET
London S. W.,
Eng and.

CONSULTING GAS ENGINEERS
AND MANAGERS.
GAS PROPERTIES PURCHASED.

GASHOLDER TANKS AND
GAS WORKS MASONRY COMPLETE

Plans prepared and Estimates furnished at short notice.

J. P. WHITTIER,
238 Java Street, Brooklyn, N. Y.

GEORGE R. ROWLAND.

Formerly with the Continental Iron Works.

Draughtsman and Constructing Engineer.

Drawings, Specifications and Estimates furnished for the construction of new works or alteration of old works. Special attention given to Patent Office drawings.

Office, No. 245 Broadway, N. Y. City.

Foundries and Works: { Millville, N. J. / Florence, " / Camden, "

R. D. WOOD & CO.

ENGINEERS, IRON FOUNDERS, MACHINISTS

400 Chestnut Street, PHILADELPHIA, PA.

MANUFACTURERS OF

Cast Iron Pipe.

SOLE MAKERS OF

THE MITCHELL SCRUBBER

(PATENTED.)

PURIFIERS, CONDENSERS, SCRUBBERS, BENCH WORK.

BUILDERS OF

Gas Holders.

Single, Double and Triple Lifts, with or without Wrought Iron or Steel Tanks.

CUTLER'S PATENT FREEZING PREVENTER For Gas Holder Cups.

THE TAYLOR REVOLVING BOTTOM GAS PRODUCER.

HEAVY LOAM CASTINGS, DUNHAM SPECIALS, HYDRAULIC WORK, LAMP POSTS, VALVES, Etc.

ISBELL-PORTER CO.,

ENGINEERS AND CONTRACTORS FOR THE

Construction and Extension of Gas Works.

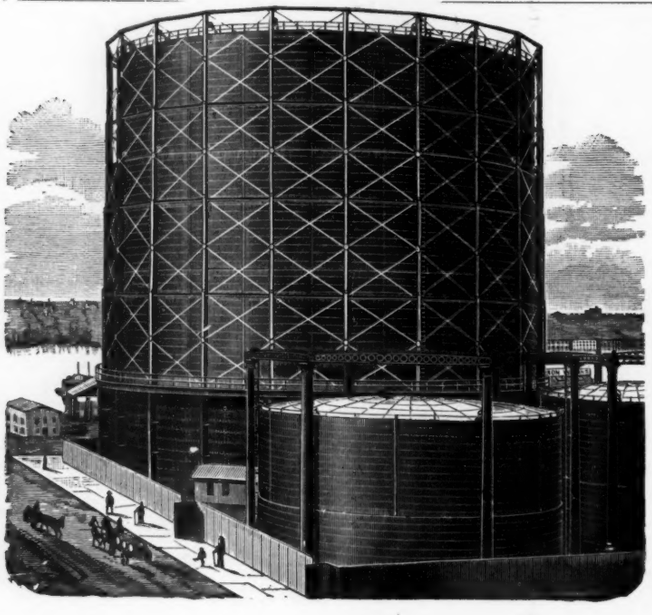
FOUNDERS AND MACHINISTS.

MANUFACTURERS OF

All Ironwork and Machinery Required in a Gas Plant.

Estimates, Drawings and Specifications furnished for the Alteration, Improvement, or Extension of Existing Works or the Construction of New Works.

245 Broadway, New York City. OFFICES Bridge & Ogden Sts., Newark, N. J.



The Continental Iron Works,

THOMAS F. ROWLAND, President.
WARREN B. HILL and CHAS. H. CORBETT, Vice-Presidents.
THOMAS F. ROWLAND, Jr., Secretary & Treasurer.

West and Calyer Sts. (Near 10th & 23d St. Ferries)
NEW YORK, Borough of Brooklyn.

BUILDERS OF

Gas Holders.

Single and Multiple Section Gas Holders a Specialty.

STEEL GAS HOLDER TANKS.

BENCH CASTINGS, RETORT LIDS.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, Etc.

Self-Sealing Retort Mouthpieces & Lids

For Round, Oval, or "D" Retorts.

ILLUMINATING GAS! FUEL GAS!

THE LOOMIS PROCESS.

Now in successful operation at Works of John Russell Cuttlery Co., Turner's Falls, Mass., and Henry Disston's Son's Saw Works, Tacony, Pa.

The Cheapest Gas Generating System in the World.

Plans and Estimates Furnished.

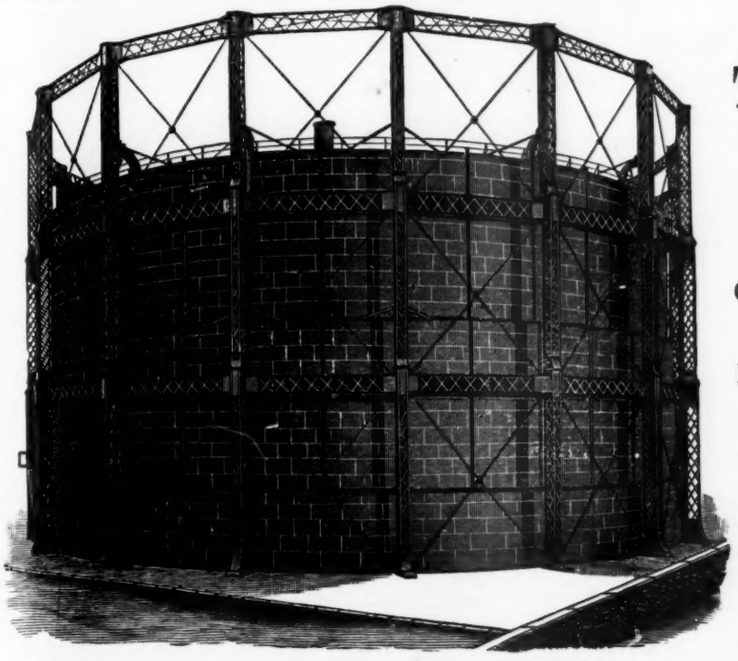
BURDETT LOOMIS, - - Hartford, Conn.

To Gas Companies.

We make to order CAP BURNERS to burn any amount under a stated pressure. Send for samples.

Also SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

C. A. GEFRORER,
248 N. 8th St., Phila., Pa.



H. RANSHAW, Prest. & Mangr. T. H. BIRCH, Asst. Mangr.
WILLIAM STACEY, Vice-Prest. R. J. TARVIN, Sec. & Treas.

THE STACEY MANUFACTURING CO.

Established 1851.

Single, Double and Triple-Lift

GASHOLDERS,

Of any Capacity, with or without Wrought Iron or Steel Tanks.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, etc.

Coal Gas Benches, Roof Frames,

OIL STORAGE TANKS.

Pressed Steel Mouthpiece Lids, Self-Sealing Mouthpiece Lids.

Cincinnati, Ohio.

RITER-CONLEY MFG. CO.,

GASHOLDERS, with or without Steel Tanks.

Purifiers, Condensers, Scrubbers, Oil Tanks, Smoke Stacks.

STEEL ROOFS and BUILDINGS.

PLATE AND STRUCTURAL WORK OF EVERY DESCRIPTION.

GENERAL OFFICE: Pittsburg, Pa. EASTERN OFFICE: 39-41 Cortlandt St., New York City.

WM. HENRY WHITE,

No. 32 Pine Street, - - - New York City.

ENGINEER AND CONTRACTOR FOR THE

ERECTION AND EXTENSION OF

GAS, WATER, AND ELECTRIC LIGHT WORKS.

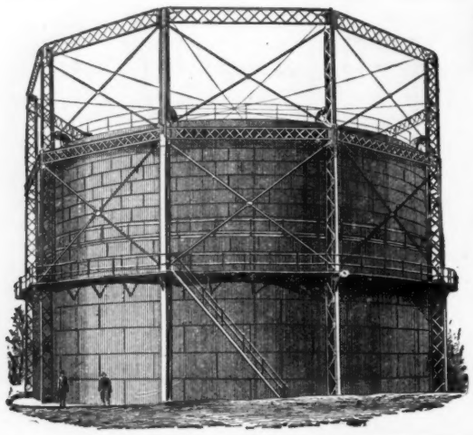
Correspondence with Gas Companies contemplating extending or improving their Plants respectfully invited.
Plans and Estimates Furnished.

1899 DIRECTORY 1899

OF AMERICAN GAS COMPANIES

Price - - - - - - - - - $5.00.

A. M. CALLENDER & CO., - - No. 32 Pine Street, New York.



1842 ※ Deily & Fowler, ※ 1900

LAUREL IRON WORKS.

Office, No. 39 Laurel Street, Philadelphia, Pa.

BUILDERS OF

Gasholders

Single or Telescopic. With or Without Iron or Steel Tanks.

OIL TANKS, WATER TANKS, AND GENERAL WROUGHT IRON WORK.

James R. Floyd's Sons,

FREDERICK W. FLOYD, President.
HENRY E. FLOYD, Vice-President.
JAMES R. FLOYD, Jr., Sec'y & Treas.

531 to 543 West 20th Street and 530 to 540 West 21st Street, N. Y.

Engineers and Contractors for the Construction of Gas Works.

MANUFACTURERS OF

All Kinds of Castings and Iron Work for Gas Apparatus.

ESTABLISHED 1856.
INCORPORATED 1899.

Write for Estimates to
539, West 20th St., New York City.

LOGAN IRON WORKS,

Brooklyn, N. Y.

BUILDERS OF

GASHOLDERS

Oil Tanks, Water Tanks, and General Wrought Iron Work.

1899 brought to us the **Largest Number of Gasholder Contracts** of any year in our history. Work was erected abroad as well as in many States of the Union, covering points separated by thousands of miles.

PLANS AND SPECIFICATIONS FURNISHED AND CORRESPONDENCE SOLICITED.

BINDER for the JOURNAL.

Price $1.00.

A. M. CALLENDER & CO., 32 Pine Street, N.Y.

—THE—

Valuation of Gas, Electricity and Water Works

FOR ASSESSMENT PURPOSES.

SECOND EDITION.

By THOS. NEWBIGGING, M.Inst.C.E., and WM. NEWBIGGING, Assoc.M.Inst.C.E.

With an Appendix of Decided Cases.

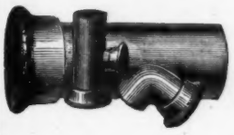
Price $2. For Sale by

A. M. CALLENDER & CO., 32 Pine Street, N. Y. City.

WARREN FOUNDRY AND MACHINE CO.,

Established 1856. Works at Phillipsburgh, N. J.

New York Office, 160 Broadway.



CAST IRON WATER AND GAS PIPE,

FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Brancher, Bends, Retorts, etc., etc.

"GLOBE" SPECIALS, VALVES, ETC. "GLAMORGAN" FIRE HYDRANTS

M. J. DRUMMOND & CO.

MANUFACTURERS OF

CAST IRON

FLANGE

GAS AND WATER PIPE

GENERAL SALES OFFICE, 192 BROADWAY, NEW YORK.

Western Office: Monadnock Block, Chicago, Ills.

GEORGE ORMROD, Mangr. & Treas., Emaus, Pa.
JOHN DONALDSON, Prest., Betz Bldg., Phila., Pa.

EMAUS PIPE FOUNDRY.

DONALDSON IRON COMPANY. EMAUS, PA.

MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

POOLE ON FUELS.

THE CALORIFIC POWER OF FUELS.

By HERMAN POOLE, F.C.S.

Price, $3. For Sale by

A. M. CALLENDER & CO., 32 Pine St., N.Y. City.

The Gas Engineer's Laboratory Handbook.

By JOHN HORNBY, F.I.C. Price, $2.50.

A. M. CALLENDER & CO., 32 Pine St., N. Y. City.

Established 1854.

D. McDONALD & CO.,

MANUFACTURERS OF

WET AND DRY METERS, STATION METERS AND METER PROVERS.

ALSO MAKERS OF

THE GLOVER PREPAYMENT METER.

The amount of gas delivered for the coin can be instantly and positively changed without removing the meter or replacing any parts.

The gas registered agrees absolutely with the amount purchased by the coin.

WE HAVE MADE AND SOLD IN THE UNITED STATES

OVER 50,000 OF THESE METERS,

ALL OF WHICH ARE GIVING PERFECT SATISFACTION.

Correspondence Solicited.

511 West Twenty-first Street, NEW YORK. | 51, 53 & 55 Lancaster Street, ALBANY, N. Y. | 34 & 36 West Monroe Street, CHICAGO.

Established 1849. With the best facilities for manufacturing, is enabled to furnish reliable work and answer orders promptly.

NATHANIEL TUFTS METER CO.,

8 Medford Street, Boston, Mass.

MANUFACTURERS OF

DRY GAS METERS.

Station Meters of any Capacity.

Test and Experimental Meters, Pressure Registers, Pressure Gauges.

METER PROVERS, PHOTOMETERS, STREET LANTERNS, ETC., ETC.

Prepayment Gas Meters.

CHARLES E. DICKEY. JAMES B. SMALLWOOD. CHARLES H. DICKEY.

THE MARYLAND METER AND MANUFACTURING CO.

Established 1866.

BALTIMORE, North & Saratoga Sts. **CHICAGO, 107 West Monroe St.**

SAN FRANCISCO, 221 Front St.

CONSUMERS' & STATION METERS, PRESSURE GAUGES, Etc., Etc.

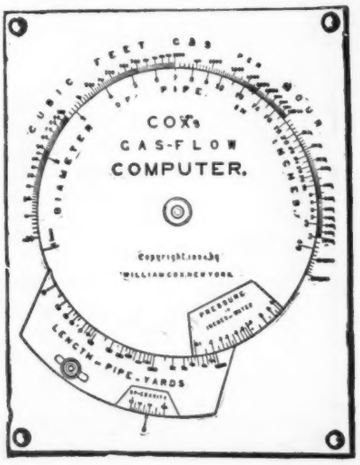
"Perfect" Gas Stoves

A PERFECTLY ACCURATE METER
AN ALWAYS-TO-BE-DEPENDED-ON METER
A BEST-MADE METER
A SURE-TO-PLEASE METER

THE KEYSTONE METER

Made at ROYERSFORD, PA.

Pacific Coast Supplied by WIESTER & CO., 17 & 19 New Montgomery St., San Francisco, Cal.



Do you wish to Know

what size of Pipe to use to convey any quantity of Gas, any distance, with any loss of pressure, and any initial or final pressure? Then use

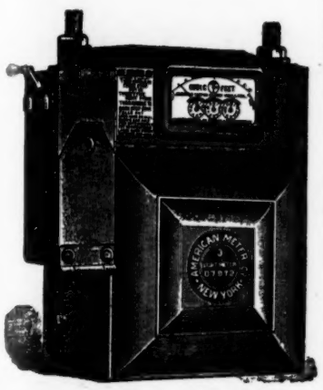
COX'S GAS FLOW COMPUTER,

as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.

Price, 6.5 x 8 inches, in cloth case, $2.50.

For sale by

A. M. CALLENDER & CO., 32 Pine St., N. Y. City.



American Meter Co.

NEW YORK, PHILADELPHIA,
SAN FRANCISCO.

Prepayment Meters.

Their construction is such that they may be readily readjusted when the scale of gas rates is changed.

HELME & McILHENNY,

Established 1848. **1339 to 1349 Cherry Street, Philadelphia, Pa.**

MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

METERS REPAIRED

PREPAYMENT GAS METERS.

Our Own Patents. Strong. Simple. PROMPT ATTENTION. CORRESPONDENCE SOLICITED.

METRIC METAL COMPANY,

MAKERS OF

GAS METERS for NATURAL and ARTIFICIAL GAS.

Special Attention given to Repairing METERS of all Makes.

FACTORY AT ERIE, PA.

EXCERPTS FROM DECISIONS

—OF THE—

BOARD OF GAS COMMISSIONERS of the COMMONWEALTH OF MASSACHUSETTS.

MR. E. H. YORKE, NEW HAVEN, CONN., Dec. 1, 1898.

Dear Sir:—I am in receipt of a copy of "Excerpts from the Decisions of the Board of Gas Commissioners," which is a handy compilation in book form of extracts from the most recent decisions of the Gas Commission of Massachusetts.

I note that most of these extracts are broad and safe-guiding precepts, which apply with equal force to one Company as to another. The 13 years' existence of the Board of Gas Commissioners with its unusual opportunities for acquiring information, have justly made it a high and safe authority in all matters pertaining to the management, obligations, and rights of Gas Companies. Your little book will serve as valuable reference library in settling legal complications which often arise between a Gas Company and its customers.

Yours truly, (Signed) F. C. SHERMAN, Superintendent.

A 28-page Pamphlet containing the cream of this Board's decisions as to the proper management of Gas Companies.

Compiled by E. H. YORKE. Price $1.00. Address

A. M. CALLENDER & CO., - No. 32 Pine Street, N. Y. City.

The advertisement of

THE WESTERN GAS CONSTRUCTION COMPANY, Engineers and Builders,

Improved Double Superheater Lowe Water Gas Apparatus—Manufacturers of General Gas Works Machinery—Builders of Gas Works

WM. HENRY WHITE, Eastern Engineer,
32 Pine St., New York.

FORT WAYNE, IND.,

Occupies this space every alternate week

JOHN J. GRIFFIN & CO.,

1513-1515-1517-1519-1521 Race Street, Philadelphia.

52 Dey Street, New York.
WM. S. GRIBBEL, Manager.

75 N. Clinton St., Chicago.
FREDERICK WAUGH, Manager.

MANUFACTURERS OF

STATION METERS, CONSUMERS' METERS,

Provers, Registers, Gauges, Experimental Apparatus, Etc.

Prompt Attention Given to All Repairing.

OUR SPECIAL NATURAL GAS METER

Is the Best ever offered. Over 30,000 now in use.

We manufacture in the United States, under the SAWER & PURVES PATENTS, the

Positive Prepayment Meter.

. . SIMPLE . .

. DURABLE .

. ACCURATE .

. RELIABLE .

All Parts Interchangeable

This Meter is an unqualified success in Great Britain. Its simplicity of construction, and the positive character of the service performed by it, have given it pre-eminence.

Needs Only the Care Given an Ordinary Meter.
Saves MONEY, TIME and CONSUMERS.
Dispenses with "DEPOSITS" and Increases OUTPUT.